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THE MEDICAL ASPECTS OF RECONSTRUCTION.

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In the ordinary practice of medicine, apart from the fundamental question of diagnosis, the doctor finds himself mainly concerned with the closely interwoven problems of the prophylaxis and treatment of disease. The war has emphasized the importance of that other duty of the physician which is so difficult often to fulfil, namely, the care of convalescence—that part of medicine which may more properly be regarded as "reconstruction."

When the acute symptoms of a disease have passed, when convalescence is well established, the activities of the physician too often come to an end. In private practice the doctor, sensitive lest he may seem unnecessarily to obtrude his services on the patient, who no longer needs immediate supervision because of the emergencies of the disease, makes his adieu with an earnest recommendation that the invalid take a suitable vacation, advice which the latter rarely feels justified in following.

In hospitals the demand for space requires that the patient be discharged so soon as he is comfortably on his feet. A few fortunate institutions are able to offer to a limited number of patients the advantages of a "convalescent home," which affords rest and good food for perhaps two weeks. In general, however, with the discharge of the doctor in private practice, or of the patient in hospital, the duties and responsibilities of the physician as regards that particular individual are considered to be at an end. The conduct of his convalescence is left to the patient, who is now his own master.

In war, conditions are different. The patient is not his own master; he is the servant of his country and his master needs his services as quickly as they may be available. These services are, however, useful only when the subject is restored to complete efficiency and able to perform his duties to the full. The conditions of service in France were such that every man who could be returned to the line and every man who could be useful at the base was needed at the earliest moment; on the other hand, it was equally desirable that every man who was not fit for service be returned to America with the least possible delay. Thus it was that the exigencies of war soon brought it about that the study and care of convalescence became one of the most vital and important of medical questions.

In other words, in war time in France the value of the care of convalescence, of medical reconstruction in its narrow sense, came to take its proper place in the practice of medicine.

It is not alone to the period after discharge of the patient from the hospital that the term "reconstruction" may be applied. To think of reconstruction as applicable alone to the treatment of those convalescent from a grave wound or malady is an idea as mistaken as to think of prophylaxis as associated only with measures of general sanitary preparation, such as one may adopt before the occupation of a camp site, or to think of treatment as of necessity associated with the wards of a general hospital. In reality the problems of reconstruction are so closely interwoven with questions of prophylaxis and of treatment, that in private practice, as well as in war time, they form an indivisible trinity.

The individuals with whose rapid and efficient rehabilitation we were concerned may briefly be classified as follows:

1. Those numerous instances of exhaustion, concussion, and especially of fear, anxiety neuroses and psychoneuroses of all sorts, which, if not arrested at an early period, so easily pass down the line of communications and under the influence of the surroundings of a general hospital become "fixed."

2. The mildly gassed, who are especially liable, if not properly cared for, to present annoying psychoneurotic phenomena.

3. Those psychoneuroses of a more serious character which need longer treatment and care at a base hospital.

4. Convalescents from all types of non-disabling wounds, gas intoxication, operations and disease.

5. Patients suffering from that complex of symptoms known in the A. E. F. as an "effort syndrome," a group which includes many of the convalescent gassed.

6. The tuberculous.

It was soon found that in the confusion of battle and the necessity of rapid evacuation a large number of men suffering from simple exhaustion, fear, concussion and a variety of lesser functional

nervous phenomena, and often incorrectly classed among the gassed, passed back into base hospitals, far distant from their original station. The same was true of many of the mildly gassed. Some of these men recovered quickly after a few days' rest. Many were clamorous to return to the front. Some were quite ignorant as to why they had been sent back. These men, who before returning to their organizations were obliged to go to a depot division, were permanently separated from their original assignments. Lying about hospitals they rapidly lost morale, discipline and physical vigor, and on their arrival at a depot division were soft in every way. In others of a more impressionable character, ill-judged treatment in a general hospital resulted in the fixing of psychoneuroses which, once established, were difficult to overcome. It became clear early that measures must be taken to hold these men so near the front as possible at some point where they might be given rest, suitable treatment and study. This was the main problem of reconstruction at the front.

At the base the problems were almost equally urgent. The ordinary disability board in the crowded hospital, obliged to pass upon the soldier as he is hurriedly evacuated, can make but an imperfect and superficial prognosis as to the future capabilities of the given individual, an estimate often changed over and over again as the convalescent passes from hospital to hospital on his way toward the rear. During the often long periods of physical inactivity the patient's muscles become relaxed and his morale depressed, and soldiers frequently required considerable periods of retraining before they were able to take up their functions. With others it was only through the discovery by actual test at the front and failure satisfactorily to perform the duty assigned to them that men found gradually their proper level. This meant a material loss of time. It became evident that those men who, on discharge from the hospital of the first instance, were regarded as fit for some duty in France must be sent directly to some spot where they might receive such treatment and training as would prepare them at the earliest possible moment for the special functions which they might have to fulfil. This was the main problem of rehabilitation as it related to the base.

1. Problems of Reconstruction in Divisional, Corps and Army Areas. The first desideratum, as has been said, was that instances of exhaustion, fear, the mildly gassed and psychoneuroses be held for a few days at field hospitals or at divisional or corps rest or retraining camps. That a proper selection of suitable cases be made demands the presence of well-trained medical officers at the "*triages*"—advanced field hospitals—that which, unfortunately, was not always possible in the organization that we possessed in France. Excellent results, however, followed the stationing at these points, at the suggestion of Col. Salmon, of trained neuro-

psychiatrists. Here many instances of simple exhaustion or fear or concussion, which previously had been sent to the rear, perhaps as gassed, were held, suitably treated and returned to their organizations after two or three days' rest. Under favorable circumstances it was found that as many as 80 per cent. were returned to their divisions—the average during the Argonne offensive was 65 per cent.

But in times of special stress such measures were not possible at crowded field hospitals in corps and divisional areas. The wise measure was accordingly adopted of establishing in the army area special so-called neurological hospitals and special gas hospitals. The neurological hospitals were under the general supervision of Col. T. W. Salmon, senior consultant in neuropsychiatry, the army psychiatrist and a carefully selected staff. To Col. Salmon's foresight, good judgment and efficiency as director and senior consultant in neuropsychiatry our army owes much.

In the Argonne the gas hospitals were placed temporarily under the professional supervision of Lieut.-Col. Richard Dexter, senior consultant in medicine for gas. Between these two groups of hospitals the mildly gassed and the instances of exhaustion, fear and other lesser psychoneuroses were differentiated, and suitable treatment, mental and physical, was afforded to all.

From the neurological hospitals an average of 58 to 60 per cent. were returned to the front. From the gas hospitals many of the simply exhausted were also sent directly to such corps as had established a rest camp or replacement depot, and thereby saved to their original organization; others passed to the rear and were distributed in various base hospitals. The early and proper treatment of the gassed resulted in a material shortening of the period in hospital, and hastened their return to active service.

While the desirability of the designation of special base centres or hospitals for the care of the gassed was recognized, the difficulties of evacuation were such that their establishment had not become possible at the time of the armistice.

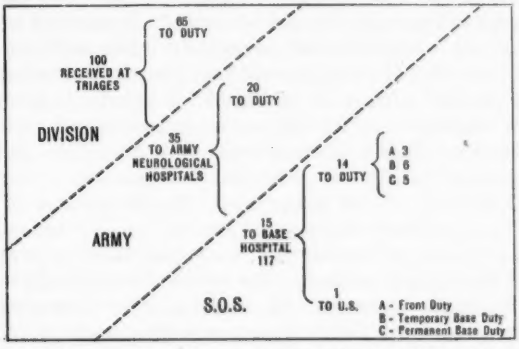
2. Problems of Reconstruction at the Base. In base areas there were established certain institutions which were in a stricter sense reconstruction centres.

(*a*) *The Neurological Base Hospital* (117) *at Lafauche.* Thus, at Lafauche, not more than fifty miles from the front, there was a special neurological hospital (117), to which were sent those cases returned from the like hospitals in the army area. Here and in a small adjacent convalescent camp, under the care of a selected staff, over 93 per cent. of these cases were returned to duty—20 per cent. to field duty. Only 7 per cent. of those sent from the front to Base Hospital 117 were returned to America.

The nature and value of this institution, Col. Salmon has discussed elsewhere. To this hospital, which, in extent, was far from adequate to the demands made upon it, psychoneuroses arising elsewhere in the A. E. F. were also sent so far as possible.

(*b*) *The Orthopædic Retraining Centre.* The earliest of the special reconstruction centres was the Orthopædic Retraining Camp established by Dr. Goldthwaite, first in the Vosges and afterward at St. Aignan in Touraine. Here excellent work was done in rehabilitating officers and men whose disabilities were found to depend on various remediable surgical defects, especially on bad shoeing.

(*c*) *The Convalescent Camps.* To meet the demand for a more rapid and efficient rehabilitation of all convalescents there was planned near each group of base hospitals, a special camp, in which it was hoped that convalescents might receive carefully devised physical and mental training, associated with skilled supervision, which, on the one hand, might be directed toward the rapid rehabilitation of the patient and on the other toward the earliest possible recognition of the moment at which he was fit to return to duty.



Outcome of concussion and nervous cases arising in battle. (Salmon.)

Into the history of these institutions it is impossible to enter at length. Already at the time of the inception of our hospital system the convalescent camp in the British service had reached a high degree of efficiency. The British experiences and the results which they had achieved were of the greatest value to us. It was, after all, on the British model that we had hoped to build. Suffice it to say that at the outset, designed as an overflow, to relieve the crowded base hospital so soon as might be, they were regarded as commands suitable for older or less capable officers. Soon, however, the value and importance of the work of retraining, the complexity and delicacy of the problems involved, the necessity that the director of such a camp should be possessed of signal tact and judgment and *savoir faire*, brought it about that in the British service the position of commanding officer of a convalescent camp came to be one for which officers of the very highest qualifications were sought.

Our camps were under canvas, and it was desirable that the conditions under which the men should live might be so nearly as

possible those which they might expect under favorable conditions while on active duty. The camp was under the charge of a medical officer. It was not, however, a hospital but a retraining centre. The object to be attained was the most rapid possible preparation of the individual for his return to duty. To accomplish this it was necessary to consider both the mental and the physical aspects of the case. The soldier must be given graded physical training, carefully adapted to his powers; these powers must be tested at frequent intervals. As the individual proved himself able to return to duty he must be sent to the depot camp or reclassified and assigned to that duty for which he was fitted. To accomplish this with the greatest efficiency a carefully designed schedule of work, play and amusement must be arranged. The soldier must, in the first place, be always under military discipline. He must be on a duty status. This he should never be allowed to forget. Periods of drill, setting-up exercises and marches, should be carefully interlarded with other periods of rest, recreation and amusement. The amusements and periods of rest should be so planned that the patient's mind should, so far as possible, always be healthfully occupied. It is often true that men who tire soon at drill, enter enthusiastically into games through which valuable physical training is acquired. Relaxation in the shape of music and theatrical performances, in which the patients take part, should be provided. The programme of the day should be so ordered that the soldier has no idle time, and the schedule of work and play should be one calculated to improve the morale of the camp as a whole. For neurotic individuals, especially those with effort syndrome, the moral aspects of treatment are especially important. With many such the work should be so arranged that at the outset, although under military discipline, the men may not feel themselves driven—that the primary physical demands may not be too great. Such men, started aright, soon find themselves carried along in the general stream, and freed from anxiety and apprehension, they gain with surprising rapidity. The soldier should be observed by medical officers at the end of drills, marches or exercises. So soon as he becomes able without effort to perform the work and play of a given class, he should be passed on to the class above in which the physical demands are greater. The demands for graduation from the last class should be equal to those to which the soldier is subjected on a duty status.

Such, roughly, was our ideal of the convalescent camp. To each of our institutions an officer was assigned who had had special training in cardio-vascular disease and had passed several months at Colchester with Dr. Thomas Lewis—officers carefully selected and supervised by Lieut.-Col. Alfred E. Cohn, senior consultant in cardio-vascular disease, whose excellent conception of the convalescent camp was set forth in lectures before the Army Sanitary School.

To these camps convalescents of all sorts were sent so soon as they might be discharged from hospital. Although, at the period of the armistice, most of our camps were in a crude and undeveloped state, several had demonstrated their value. It had been hoped that a special central laboratory and camp for the study and treatment of effort syndrome might be established at Pougues les eaux, but it was considered better to send the ordinary run of cases of effort syndrome to these camps, and the results, so far as we could judge, were good.

(*d*) *Measures with Regard to Tuberculosis.* In the early spring of 1918 Col. Bushnell, impressed by the considerable number of instances of so-called pulmonary tuberculosis returning from France, detailed Major, now Lieut.-Col. Webb, to investigate the matter. Col. Webb found that out of one hundred cases arriving at an American port with the diagnosis of tuberculosis, only about 30 per cent. presented manifestations justifying the diagnosis. On arriving in France and studying the conditions at a base port where patients were being gathered for deportation, similar conditions were found. This was due largely to (*a*) a lack of proper knowledge of physical diagnosis or a lack of attention on the part of the officers in charge, or (*b*) to the habit of accepting the interpretation of a Roentgen-ray plate by a radiologist as evidence of active tuberculosis. Systematic instruction in the diagnosis of tuberculosis was given by Lieut.-Col. Webb in many of the base hospitals; furthermore, arrangements were made by which all cases in which tuberculosis was suspected without the demonstration of bacilli in the sputa were referred to special collecting centres in which arrangements for their proper study were afforded. In two of these centres near base ports special arrangements for the detention and care of the tuberculous who needed rehabilitation before deportation were provided.

These in a general way were the measures of medical reconstruction adopted in France.

The experience gained in the British convalescent camps and in one of our incomplete and mushroom-like organizations has given us some results on which it is worth dwelling. At one of the earliest of these formations, convalescent camp No. 2 at Lifol le Grand, Capt. Bridgman was able to make some interesting observations. Here careful physical examinations of the patients were made by competent officers on entrance and before discharge, and a "follow-up" system was established which was designed to obtain replies from battalion medical officers two months after the return of the soldier to his organization and again in six months. Out of the first 5000 cases replies after two months were received in 2000, from which it became apparent that outside of the killed and wounded, over 99 per cent. of those returned to duty as Class A men were performing their normal functions—a significant evidence of the value of a well-ordered convalescent camp.

It was further possible, with a considerable group of these cases, to study the period between the admission to hospital, the onset of disease or operation and the moment at which the subject had proved himself fit for full duty.

In other words, these convalescent camps in war offered for the first time, so far as I am aware, an opportunity to obtain information as to the average duration of convalescence from ordinary medical and surgical conditions in the normal young adult. The figures published in the article soon to appear by Captain Bridgman and shown on the chart are suggestive. They emphasize the point with which I began, namely, that in medical practice the question of convalescence is sadly neglected.

TABLE SHOWING THE AVERAGE TOTAL PERIOD IN HOSPITAL AND CONVALESCENT CAMP OF MEN DISCHARGED TO DUTY.
(MODIFIED FROM BRIDGMAN.)

Diagnosis.	No. of cases.	Average total stay in hospital and camp.
Medical Conditions.		
Influenza	828	31
Pneumonia	170	58
Acute bronchitis	233	36
Mumps	53	39
Measles	18	27
Scarlet fever	7	77
Catarrhal jaundice	7	38
Diphtheria	5	57
Tonsillitis and sinusitis	90	34
Surgical Conditions.		
Hemorrhoidectomy	25	45
Herniotomy	41	50
Hydrocelotomy	7	54
Tonsillectomy	8	37
War Casualties.		
Gas	1195	37
Enteritis	512	30
Concussion	192	45
Exhaustion	80	40

When we consider, as Bridgman has pointed out, that it takes a robust young soldier thirty-four days to pass through and recover from the effects of an acute tonsillitis, fifty-eight days from a pneumonia, seven weeks from a herniotomy, five weeks from a tonsillectomy, with all the advantages offered by a convalescent hospital, we may well pause and reflect.

The grave sequels of so many acute infections, especially the psychoneurotic phenomena following operations and many of the continued fevers, might well be in part avoided if we possessed in civil life opportunities to offer that which we were beginning to provide for the care of our troops in France—adequate care of con-

valescence. It is easy to see what an immense advantage such institutions for the care of convalescents would be to large industrial institutions. It is equally easy to comprehend the grave difficulties which would attend the conducting of such an institution in civil life. Nevertheless, it is clear that convalescent departments are needed and should be started in connection with our large hospitals; not convalescent homes, but institutions under the charge of active and specially trained physicians; institutions in which every arrangement for the well considered rehabilitation, mental and physical, of the convalescent may be carried out. Here in America the admirable work of General Hospital No. 9, at Lakewood, has shown what symptomatic, physical and mental training may do for the large body of slightly subnormal individuals from whose ranks a considerable percentage of the effort syndrome were derived. The treatment of these cases differs in no essential from that which should be afforded to convalescents in civil life.

If our experience in this war shall help to awaken a new interest in the care of convalescence and shall convince the medical profession and the general public of the importance of suitable physical training in the rehabilitation of the inefficient, a beneficent advance will be made in the art of medicine.

CARDIAC DIAGNOSIS IN THE LIGHT OF EXPERIENCES WITH ARMY PHYSICAL EXAMINATIONS.[1]

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During the period of nineteen months which elapsed between the entrance of the United States into the war and the signing of the Armistice, approximately 4,000,000 soldiers, most of them recruits, were subjected to a special physical examination of their circulatory apparatus by officers chosen for their supposed special fitness for this work. No similar examinations upon any such gigantic scale have ever before been attempted.

It seems appropriate at this time to attempt to take stock of what has been accomplished by all this elaborate effort; to inquire whether, in the first place, the direct and immediate benefits to the army have been such as to justify this effort; and, in the second place, whether these examinations have added anything of permanent value to our knowledge of cardiac disorders or of cardiac diagnosis.

[1] Read at the meeting of the Association of American Physicians, Atlantic City, June, 1919.

In the present paper no attempt will be made to answer the first query further than to express the belief that the results of the policy of the Surgeon-General of having the cardiovascular examinations of recruits made only by officers of special training and qualifications have more than justified the added expense in personnel, time and money.

As for the question as to whether anything of permanent value has been added to our knowledge of cardiac disorders and of cardiac diagnosis, that can be answered unhesitatingly in the affirmative. There can be no doubt that a real advance has been made in certain phases of cardiac diagnosis, and it is interesting to note that this advance was made not through refinements in laboratory technic or by means of more delicate instruments of precision, but chiefly through the opportunity afforded to examine an immense number of young men, almost all of whom were normal subjects, and to learn the frequency and the extent of normal variations of the physical signs of the heart. This extension of our knowledge of the normal variations I should be inclined to place as the most important gain made in cardiac diagnosis. Next to this should be put the gain in knowledge of the functional disorders of the heart, especially of the so-called irritable heart; and, third, I should place the advance in the diagnosis of the milder forms of organic valvular disease.

Three types of cardiac disease, which in civil life are among the commonest seen by the hospital physician, were conspicious by their rarity: (1) as was to be expected, the degenerative conditions common to middle and old age; (2) the severe forms and the advanced stages of rheumatic valvular disease, and (3) syphilitic disease of the aorta and heart. The extreme rarity of syphilitic disease deserves in passing a word of emphasis. Among 1,000,000 examinations of drafted recruits there were 11,562 rejections for cardiovascular disorders. Of this number only 20 were rejected, with the diagnosis of thoracic aneurysm. While this figure doubtless does not represent fully the incidence of the disease, and while an occasional aneurysm manifested itself during military service, they were, nevertheless, extraordinarily rare. Much the same may be said concerning the syphilitic type of aortic insufficiency which all the available evidence shows to have been extremely rare, even among the negro troops. Indeed, when one considers the incidence of syphilis among males between the ages of twenty-one and thirty-five years, one might venture, on the basis of the army examinations, to formulate something approaching the dignity of a law, to the effect that *in cases of acquired syphilis the clinical evidences of involvement of the aorta and heart almost never appear before the thirty-fifth year.*

The examiners, as has been said, were selected for their supposed special fitness for this work, as shown either by their past experience

or by their response to the special training furnished them by the army schools. Although it would be incorrect to say that all of these several hundred special cardiac examiners possessed exceptional qualifications for the work in hand, it is unquestionable that many of them did. In making up the various groups of examiners, pains were taken to see that in each group at least the officer in charge should be known to be a clinician of experience and special training. Moreover, with the records at hand from the examining boards of each of the fifty or more camps and recruiting stations it was possible to establish averages and controls by which to assess the diagnostic accuracy of the individual boards. Supervision and control were further exercised by occasional visits of inspectors and consultants. In these various ways it was possible, therefore, to keep in touch with the work done in the different camps and to ascertain the difficulties and common errors in diagnosis. Methods of examination and criteria of diagnosis were standardized, insofar as possible, by rules prescribed by the Surgeon-General and issued first in the form of a circular of instructions. These instructions were drafted with consummate skill by the late Major T. C. Janeway, and have formed the basis for all the later rules governing such examinations included in the selective service regulations.

Normal Variations of Physical Signs. As has been said a realization of the fact that the physical signs of the normal heart are subject to much more frequent and much wider variations than has generally been supposed is to be regarded as one of the important gains for cardiac diagnosis which has come out of the war experiences. These variations affect every type of cardiac physical sign; the position of the apex-beat, as shown by inspection and palpation, the distinctness and character of the cardiac impulse, the area of cardiac dulness, the character and intensity of the heart sounds, all are subject to surprisingly wide variations in perfectly normal individuals. Only a few of the more important of these variations can be discussed here.

The distinctness and the character of the cardiac impulse depend to a very marked degree upon the special conformation of the thorax. If the latter is deep and roomy only a faint and sharply localized apex-beat will be seen and felt. If, however, as often happens, the chest is flat and the space between the bodies of the vertebræ and the sternum very small the heart gives the impression of being flattened up against the chest wall, and there is a marked visible and palpable impulse which may involve all the precordium to the left of the sternum and occasionally even the sternum itself. This together with the associated large area of dulness may readily be misinterpreted as indicating the existence of some cardiac enlargement.

The character and intensity of the heart sounds vary greatly in different individuals under similar conditions and in the same

individual under different conditions. Rest, exercise, excitement and change of posture all have their effect in modifying the character of the first heart sound and in changing the intensity of both sounds.

ACCIDENTAL MURMURS. In the modification of the first heart sound the point at which such a changed sound deserves to be called a murmur is one concerning which disagreement is common, but even under the most rigid interpretation of the term the occurrence of such systolic accidental or functional murmurs is surprisingly frequent. When the murmur is located over the base of the heart its true nature is much more likely to be recognized than when it is apical, and yet such apical accidental murmurs are very common. It is not possible to give accurate statistics, but I am convinced, in the light of my own experience, that it would be conservative to say that at least nine-tenths of all apical systolic murmurs in young adults belong to the class of accidental or functional murmurs. Rothschild's figures, which bear upon this point, will be quoted in discussing mitral insufficiency.

These apical systolic accidental murmurs have several features by which they can usually be recognized. First and foremost is their inconstancy. They may be absent during rest and be pronounced after exercise or during excitement. The first sound may be quite clear and normal in the erect posture and have all the characteristics of a murmur in the recumbent position; in the second place they usually show no tendency to be transmitted to the left of the apex; then, too, the murmur is obviously only the modified and changed first sound; it is not something clearly distinct from and additional to the heart sound as is so commonly the case with the murmur of mitral insufficiency. Lastly, such accidental murmurs seem rarely if ever to have the peculiar high-pitched, whizzing or blowing quality usually possessed by those due to mitral insufficiency.

The basal systolic accidental murmurs have much the same characteristics as those at the apex. When heard only to the left of the sternum they are usually readily recognized; but when, as occasionally happens, they are audible over both the pulmonic and the aortic areas, they may be mistaken for the murmur of aortic stenosis.

DIASTOLIC ACCIDENTAL MURMURS. The teaching that accidental murmurs are always systolic in time is in general sound even although the statement is not strictly true. Exceptions to that rule do occur, but they are certainly rare. I have myself seen three undoubted instances of diastolic cardiorespiratory murmurs heard over the base of the heart and bearing a very close resemblance to the murmur of aortic insufficiency. Two of these cases were young officers in whom the murmur had been accidentally discovered, and who after examination by a board had promptly been recommended for discharge because of aortic insufficiency.

THE IRRITABLE HEART OF SOLDIERS. (*The Effort Syndrome, Neurocirculatory Asthenia.*) Notwithstanding the fact that for nearly fifty years almost every text-book of medicine has contained some account of the condition described by Da Costa as "the irritable heart of soldiers," it is nevertheless true that up to the beginning of the war a practical knowledge of that disorder was entirely lacking. It is doubtful if one physician in a thousand had ever ventured to make the diagnosis or had any confidence in his ability to recognize a case if he should see it. It was generally looked upon as an affection peculiar to war conditions and without its counterpart in peace times.

From the very first day of the army heart examinations, however, this neurosis obtruded itself upon the consciousness of the examiners in no uncertain manner. It was far away the commonest disorder encountered and transcended in interest and importance all the other heart affections combined.

One of the most surprising things about the "soldier's heart" was the discovery that in a majority of the cases the symptoms of the disorder were not first manifested under the strain and stress of war but had existed in the recruit for years, often for many years, before the onset of his army career. These cases made up the so-called constitutional type of the disorder.

In another large group of cases the symptoms appeared in previously healthy men after an attack of acute illness, such as pneumonia, dysentery, rheumatic fever or influenza. In most of these "post-infectious" cases there is no reason to suppose that the fact that the patients were soldiers bore any direct relation to the development of the neurosis.

It is clear, therefore, that the affection is far from being peculiar to the conditions of war or to army life. Only a small proportion of the cases have their origin in such special conditions. Obviously, then, the syndrome must exist and must be of fairly frequent occurrence in peace times, notwithstanding the fact that heretofore we have failed so completely to recognize it. With the knowledge of the disorder gained in the war, however, there should be no question of its proper recognition in the future, and the dissemination of this knowledge throughout the profession will constitute one of the most important of the war's contributions to cardiac diagnosis.

All the experience of the army heart examinations has shown the great danger, even with experienced examiners, of mistaking this neurosis for some organic disease of the heart, in contrast to the very rare error of mistaking such organic diseases for the effort syndrome. The "soldiers' hearts" were very apt to be diagnosticated either as myocarditis or as mitral insufficiency or mitral stenosis. It was indeed often difficult to believe that a soldier who, on even moderate exertion, showed such an array of striking

symptoms (dyspnea, exhaustion, precordial pain, tremulousness, cyanosis, extreme tachycardia) could be suffering merely from a neurosis. Moreover, certain of the physical signs sometimes bore a close resemblance to those of mitral insufficiency and mitral stenosis. The pronounced and widespread cardiac impulse often suggested cardiac enlargement; the first sound at the apex was usually extremely short and sharp and the second pulmonic sound often very loud; a systolic accidental murmur was sometimes present and the suggestion of a thrill was often given to the palpating hand in the apical region. Because of the rapid heart-rate it was sometimes easy to persuade one's self, erroneously, that this slight thrill was presystolic in time. Thus with such a combination of pronounced symptoms and suggestive physical signs it is not surprising that a good deal of time was needed to educate the great body of medical officers to the true nature of these cases.

Diagnosis of the Mild Forms of Valvular Disease. The progress made during the war in the diagnosis of valvular disease has been chiefly in the direction of recognizing the need for much greater caution in making such diagnoses than was formerly generally believed to be necessary or proper. The recognition of the great frequency of normal variations from the conventional physical signs, including the prevalence of systolic accidental murmurs, as well as the knowledge gained concerning the effort syndrome and the readiness with which it may be mistaken for valvular disease, has led to the conviction that in the past this latter diagnosis was made much more frequently than it deserved to be.

The instances of valvular disease encountered in the army examinations were, practically all of them, of mild type—all the more severe and obvious cases had been eliminated by the examinations of the local draft boards—and it was characteristic of these mild forms of valvular disease that symptoms, as distinguished from physical signs, were entirely lacking. These men, almost without exception, gave a normal cardiac response to exercise, showed the same degree of physical strength and endurance as normal men and could be distinguished from these only by the physical signs of the heart.

It remained throughout the war an amazing paradox that a disorder in which the heart was known to be intrinsically normal should give rise to such pronounced cardiac symptoms, whereas the cases of valvular heart disease were so completely free from symptoms.

Concerning the diagnosis of lesions of the aortic valve there is little to say. These lesions were rare and were usually correctly diagnosticated. Not more than one recruit in every thousand was rejected for disease of the aortic valves, although every such case discovered was rejected. Aortic insufficiency was the one valvular lesion in which the tendency to err was in the direction of making

the diagnosis too infrequently. When the diastolic murmur was faint and high pitched it was occasionally overlooked, and this error was, I think, due chiefly to the failure on the part of some examiners to realize that this particular murmur is often better recognized with the naked ear in contact with the chest than through the medium of the stethoscope.

With respect to mitral lesions the examinations demonstrated clearly that the correct diagnosis of the mild forms of these two valvular lesions is by no means always as simple and easy as we have been accustomed to think. They showed, further, that when mistakes in diagnosis are made they are almost invariably in the direction of finding some valvular damage when it does not exist rather than in overlooking a lesion when it is present.

Mitral Insufficiency. The effort syndrome was the condition most frequently mistaken for mitral insufficiency, as indeed it was also for mitral stenosis. The rapid and violent heart action and pronounced cardiac impulse frequently gave the impression of cardiac hypertrophy; if, in addition, there was to be heard an apical accidental murmur the resemblance to mitral insufficiency might be close and, to the uninitiated, the diagnosis would seem to be confirmed by the pronounced subjective symptoms of precordial pain, dyspnea, palpitation, etc. With increasing experience in the recognition of the effort syndrome its confusion with mitral insufficiency became less and less frequent, for the two conditions bear little real resemblance to each other. The tachycardia, which is so constant and marked a feature of the "soldiers' heart," is no part of the clinical picture of mitral leakage, and, as has been said, the pronounced subjective symptoms were characteristic of the neurosis and were altogether lacking in the valvular cases.

The question has been much discussed of late as to whether one is ever justified in making a positive diagnosis of mitral insufficiency on the existence of an apical murmur alone, and in the absence of signs of hypertrophy and of a history of definite attacks of rheumatic fever, even though the murmur have those special characteristics of transmission and quality which are supposed to belong to that disease. My own attitude toward this question has been modified a good deal by my army experiences and without venturing to be dogmatic upon the subject I am inclined to believe that one will make fewest mistakes in the diagnosis of mitral regurgitation by adhering to the rule of never venturing a diagnosis on the presence of a murmur alone, no matter how characteristic it may seem to be. It is certain that if this rule were generally followed uncomplicated mitral insufficiency would take its place among the less frequent forms of valvular disease, as I believe it deserves to do. In this connection the statistics of Rothschild[2] are very instructive. Assuming

[2] Jour. Am. Med. Assn., February 1, 1919, lxxii, 327.

the chief criteria for the diagnosis of mitral regurgitation to be (1) cardiac hypertrophy, (2) an apical systolic murmur and (3) a definite history of rheumatic fever, and arguing that the presence together of (1) and (2), or of (2) and (3), should at least raise a grave suspicion of valvular disease, he analyzes the records of the examinations of 10,000 recruits, accepted for limited service, with these points in mind. Among this number there were 870 cases with recorded systolic murmurs, of which only 33, or 3.8 per cent. fulfilled the above requirements for the diagnosis of mitral insufficiency.

Mitral Stenosis. The physical signs of mitral stenosis are usually so distinctive and striking that it may be hard to understand why much difficulty in its diagnosis should have occurred. As a matter of fact, however, there was constantly a tendency to mistake cases of "soldiers' heart" for this form of valvular disease. This tendency was much more pronounced at first than later on, but even when the clinical picture of the effort syndrome had become a familiar and well understood one there were still occasional cases in which the differential diagnosis between this neurosis and mitral stenosis was very difficult. In the former condition the heartbeats are not only very rapid but are usually quick and forcible in character; the apical impulse often is sharp and tapping, the first sound short and sharp and occasionally a suggestion of a thrill may be felt which, because of the rapid heart rate, it is difficult to time accurately. All these signs bear resemblance to those of mitral stenosis. Occasionally, too, the first sound is impure or reduplicated, and it is easy to fancy that this is really a very short presystolic murmur.

These physical signs are often very much like those of the heart in exophthalmic goiter, which, as is well known, may closely simulate the signs of mitral stenosis. There are, however, certain differential points which will usually suffice to clear up the uncertainty between the effort syndrome and mitral stenosis. In the first place a rapid heart rate *during rest* is very exceptional in the mild forms of mitral stenosis under consideration. Usually the rate is quite normal, although it may become rapid upon even slight exertion or under excitement. On the other hand anything approaching a normal heart-rate, even during rest, is very unusual in the "soldier's heart."

In the next place a distinct and unmistakable presystolic murmur is so constant a sign of these mild cases of stenosis that this diagnosis is not justified, I think, unless the murmur is heard. It may be audible only in certain postures or only after some exertion, but is rarely, if ever, lacking entirely. No matter how suggestive the other physical signs may be, the diagnosis, in my judgment, cannot safely be made in the absence of an unmistakable presystolic murmur.[3]

[3] This view accords with that expressed by Lewis in his recent admirable monograph on the Soldier's Heart.

Finally, in the mild grades of valvular disease there are lacking all the pronounced symptoms of dyspnea on exertion, faintness, precordial pain, palpitation, tremulousness, cyanosis and sweating, which are such a characteristic part of the clinical picture of the effort syndrome. Two procedures have been suggested recently as aids in clearing up the diagnosis in doubtful cases of mitral stenosis. Morison[4] has found that the inhalation of nitrite of amyl will sometimes cause a doubtful murmur either to become more distinct or to disappear. Rothschild[5] has sought to bring out the murmur in doubtful cases with very rapid heart action by slowing the heart by the use of ocular pupillary pressure.

SUMMARY. The examination of the cardiovascular apparatus of immense numbers of soldiers by specially qualified medical officers has resulted in a distinct gain to our knowledge of certain phases of cardiac diagnosis. This gain has been chiefly in three directions: A better appreciation of the extent and the frequency of normal variations from the conventional physical signs of the heart; the recognition of the importance and frequency of the syndrome known as the irritable heart of soldiers or the effort syndrome, and an increased accuracy in the diagnosis of the mild forms of valvular disease, especially of mitral insufficiency and mitral stenosis.

Variations from the conventional physical signs of the heart are extremely common in normal individuals and affect every type of physical sign. Of these the systolic accidental or functional murmurs heard at the apex and in the pulmonic area are the most important and the most likely to lead to errors in diagnosis. It is believed that fully nine-tenths of all apical systolic murmurs belong to this class of accidental or functional murmurs.

The neurosis known as the irritable heart of soldiers has been the most frequent, and much the most important heart disorder encountered during the war. Because of the pronounced cardiac symptoms associated with it and the suggestive physical signs it is very likely to be mistaken for some organic disease of the heart, especially for mitral insufficiency or mitral stenosis. The knowledge gained of this disorder during the war indicates that only a minority of the cases have their origin in conditions peculiar to war and that the condition must have existed, and been far from rare, in civil life in spite of our failure to recognize it.

The army examinations have demonstrated that the mild grades of valvular disease, which were almost the only types encountered, show a cardiac reserve power well within normal limits and are remarkably free from subjective symptoms. In this respect they offer a striking contrast to the effort syndrome in which such symptoms are usually pronounced.

[4] British Med. Jour., April 20, 1918, i, 452.
[5] Jour. Am. Med. Assn., March, 1919, lxxii, 652.

The inclination to diagnosticate mitral leakage upon the presence of an apical systolic murmur alone is to be resisted. In the absence of evidences of cardiac hypertrophy or of a history of definite attacks of rheumatic fever it is doubtful if one is justified in making the diagnosis even though the murmur have those features of transmission and quality which are supposed to be characteristic of that disease.

In view of the danger of mistaking cases of soldiers' heart for those of mitral stenosis the latter diagnosis should not be made unless an unmistakable and characteristic presystolic murmur be present.

The extraordinary rarity of cases of syphilitic disease of the aorta and heart among the men examined seems to indicate that the clinical manifestations of syphilis in the aorta and heart almost never appear before the thirty-fifth year.

REPORT OF A CASE OF RUPTURE OF AN AORTIC ANEURYSM INTO THE LEFT INNOMINATE VEIN.[1]

By James B. Herrick, M.D.,
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This case is reported simply in order to place on record another instance of rupture of an aneurysm of the aorta into the superior vena cava. I speak of rupture into the superior vena cava, though actually the rupture was into the left innominate vein, less than 1 cm. from the cava, the opening of communication being 1.5 cm. in diameter. The autopsy (Dr. B. A. Raulston) further showed marked old and active aortitis, typically luetic. The aneurysm had its origin 4 cm. above the aortic valves, the rounded sac, some 7 cm. in diameter, projecting in such a way as to produce a pressure constriction of the superior vena cava, especially marked close to the heart where it would clearly almost completely shut off circulation in the cava and block the azygos vein. The innominate and azygos veins were "hugely distended."

The diagnosis made after an examination of the patient who came under my care in the Presbyterian Hospital January 12, 1919, was aortic aneurysm, with rupture into the superior vena cava. While I had never before seen a case of this sort, I remembered having heard Dr. Stengel make a report of one before this Association in 1900. On reading Dr. Stengel's[2] article one was referred to the fuller discussion of the subject by Pepper and Griffith[3] in their

[1] Read at the meeting of the Association of American Physicians, Atlantic City, June 17, 1919.

[2] Tr. Assn. Am. Phys., 1900, xv.

[3] Ibid., 1890, v.

paper of 1890, also presented to this Association. In 1906, also, Fussell[4] had reported an additional case as had Cary.[5] A study of these reports, and particularly of the comprehensive digest of the topic by Pepper and Griffith, left little doubt that my case was of this nature.

Epitomized, as was done by Pepper and Griffith, the diagnosis rests on the following facts:

1. *Evidence from the History and Physical Examination*—including the tests for syphilis and the examination by the roentgen ray, both made available since the time of the Pepper communication—that an aneurysm exists in the thorax.

2. *The Sudden Onset of Symptoms attending the Rupture.* Other pressure causes may lead to edema and cyanosis; the aneurysm itself may have produced these results. But with the rupture there is nearly always a recognition by the patient, as in my case, of a sudden giving way of something in the chest, a rapid increase in the swelling, cyanosis, dyspnea, etc.

3. "*Cyanosis, Edema, Coldness and Distention of the Veins of the Upper Part of the Body, with other Evidences of Obstruction to the Circulation of the Blood in the Tributaries of the Superior Cava.*" If there is no obstruction below the point of entrance of the azygos vein, edema of the chest wall will be lacking; there would also be less likelihood of marked hydrothorax. The degree of cyanosis and dyspnea has varied in the cases reported. In mine it was extreme.

4. *A Murmur Heard toward the Base of the Heart.* This is usually continuous, with a ventricular systolic crescendo. The diastolic portion of the murmur is due to the current during arterial systole. In some cases a murmur only with the systole of the ventricle has been described. Evidently the type cannot be regarded as fixed, for the condition of the aortic valves, the extent of roughness of the aortic lining, the degree of elasticity of the arterial wall and the bruit in the aneurysmal sac must differ and contribute varying factors to the murmur. The most suggestive feature seems to be the continuousness of the murmur. "Like that heard in the enlarged vessels of a thyroid gland"—"a murmur characteristic of a communication between an artery and a vein." The murmur in my case resembled those which I have sometimes heard in cases of patent ductus Botalli.

The history was obtained with difficulty because the effort of talking increased to an alarming extent the cough and dyspnea; besides, the patient was extremely irritable and at times delirious. He was a physician, aged thirty-three years. For six months he had suffered from pains in the chest which at times went out into the right arm. He admitted that he had "aortic disease," but whether by this he meant valvular disease or aneurysm was not clear. He

[4] Tr. Assn. Am. Phys., 1906, xvi. [5] Ibid., 1906, xvi.

denied syphilis, though the Wassermann test made a few days later was strongly positive (++++).

On the evening of December 9, 1918, he returned late to his office. As he was ascending the stairs he experienced a feeling as of something giving way in his chest; his neck and face felt flushed and full. The sense of choking and pressure was so urgent that as he entered the office he violently tore open his collar and the neckband of his shirt. While trying to turn on the electric light he lost consciousness. How long he lay in a swoon on the floor was not known; he thought about twenty minutes. After regaining his senses he turned on the light, looked in the mirror and saw that his face and neck were greatly swollen and "almost black in color." Breathing was difficult. He gave himself a hypodermic dose of some digitalis preparation and later summoned aid by telephone.

The history of the next five weeks is lacking in details; however, these are not essential to the story. As gathered from the patient and his wife there was most distressing dyspnea, much of the time amounting to orthopnea. Stormy spells of cough, with strangling and choking sensations and extreme cyanosis, seemed at times to threaten immediate death. The swelling of the face, neck and upper part of the body had been a striking feature of his illness, being noted almost from the first. There had been great difficulty in securing sleep even with the help of opiates. He had taken but a small amount of food, claiming that he had no appetite and that food distressed him. The thermometer had shown no rise in temperature. He had grown very weak, was irritable, unreasonable and at times somewhat delirious.

The picture presented, as I saw this patient for the first time five weeks after his accident, was one of which I have never seen the duplicate. The neck and face as well as the wall of the chest were swollen as in the anasarca of chronic parenchymatous nephritis; the injected, bulging eyeballs could be seen through the narrow slits left between the swollen lids. But instead of the pasty pallor of the nephritic facies there was a purplish, almost black color, such as is seen only in the most extreme degrees of cyanosis. The visible veins were distended and tortuous. But no feature was more remarkable than the sharp contrast between the bloated, dark, upper half of the body and the pale, emaciated lower portion. The legs were the spindle legs of one in the terminal stages of a wasting disease, with no swelling and no pitting on pressure. There was no sign of free fluid in the scrotal sac or in the abdominal cavity. The liver was just palpable. The abdominal wall itself was not edematous except slightly so above the umbilical level. The line of separation between the non-swollen pale, flaccid abdominal wall and the swollen, purplish chest wall whose skin and subcutaneous tissue felt hard and brawny, pitting only on quite firm pressure, was almost as clear-cut as is the line of demarcation in a case of gangrene, being distinctly marked close to the costal margins.

Cardiac outlines were difficult to determine because of the thick, edematous chest wall, but the heart was evidently located somewhat to the left. And it was plain that there was an increased area of dulness at the base of the heart and over the manubrium. Here also could be very clearly heard the murmur already described, which is referred to in the history sheet as follows: "A systolic murmur which lasts into diastole is heard over the precordium in front and the interscapular region behind. At the aortic cartilage the murmur is particularly distinct and most intense. Here it is continuous, soft, blowing, somewhat humming in character. It is accentuated with the ventricular systole, so that at such times it becomes a loud, slightly roughened blow." There were numerous rales, both moist and dry, over the lungs, particularly behind. At the bases was dulness with some obscuring of breath sounds as from pleural fluid.

Until his death, eight days after I first saw him, there was no change for the better, rather a gradual loss in every respect. Breathing grew more and more difficult; cough was very annoying; there developed a dysphagia of marked degree; sleep was possible only by the help of drugs; food was taken in limited quantities. There was no fever except one rise to 100° on January 15. Only occasionally was a trace of albumin found in the urine. A roentgenogram showed a shadow as from an aneurysm of the first or transverse portion of the aorta. The Wassermann test was strongly positive. The patient's mind was never quite clear, and much of the time was distinctly awry. He was irritable, unreasonable, often threatened to take his life. He gradually lost in strength, had spells of alarming cardiac weakness and finally lapsed into a condition of semistupor, from which he never fully rallied, dying January 20, 1919, at 2 o'clock in the morning.

Extended comment on this case is unnecessary, especially before this Association, to which several other similar cases have been reported and before which Pepper and Griffith presented their very complete study of the subject. The case is quite classic in its conformity to the condition as portrayed by these writers. While perforation of the aneurysm was not, strictly speaking, into the vena cava, it was so close to it—less than one-third inch—that in all essentials the case may be considered under that head.

While these typical cases permit of diagnosis if one carefully regards the history and physical findings, one may understand how variations in the size of the aneurysm, in the point of pressure on the cava, in the degree of obstruction produced and in the size of the ruptural opening may cause variations from the type, thus rendering diagnosis more difficult. Such differences in the anatomical lesion will explain the varying degrees of cyanosis and dyspnea, the absence of edema from the chest wall—azygos open—etc., in the cases as described by different writers.

Also one may understand how a mediastinal tumor might cause cyanosis, difficulty in breathing and swallowing, together with edema and venous engorgement of the upper part of the body; or how an aneurysm without rupture might lead to these symptoms. And the resemblance to the condition under consideration might be still more striking if valvular or aneurysmal murmurs or murmurs produced by pressure on vascular trunks were present. Diagnosis must at times be very perplexing. These difficulties are illustrated by a case reported by Sailer,[6] in which there was perforation of the aneurysm into the superior cava, though there was no clinical evidence of venous obstruction. On the other hand, Fussell[7] refers to a case in which sudden symptoms suggested perforation, yet none was found postmortem.

There is little that can be done for these patients except in a palliative way. Bleeding has been of only temporary benefit. Rest with the use of drugs to lessen distressing symptoms, such as cough, pain, sleeplessness, may tend to prolong life. Death may occur in a very short time after the accident, or it may be postponed many weeks or even months. One reported case is regarded as an instance of recovery.[8]

Fortunately the accident is rare. Pepper and Griffith, in 1890, found but 29 cases in the literature. Sixteen years later Fussell was able to add 7. The case here recorded, with 6 others found in the literature since 1906, makes a list of 43.[9]

ON THE CLINICAL SIGNIFICANCE OF POSTURAL CHANGES IN THE BLOOD-PRESSURES, AND THE SECONDARY WAVES OF ARTERIAL BLOOD-PRESSURE.

By Henry Sewall, M.D.,
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I. Postural Changes in the Blood-pressures.

Disturbance of the Cardiovascular Function without Organic Disease. It is a trite observation that the recent trend of medical thought has been to view pathological conditions from the functional and physiological rather than from the structural

[6] Tr. Coll. Phys. Philadelphia, 1908, 3d S., xxx, 33.
[7] Ibid., p. 34.
[8] Damaschino and Lavin: La France Médicale, 1882, i, 805.
[9] Cases recorded since 1906: Jos. Sailer: Tr. Coll. Phys., Philadelphia, 1908, 3d S., xxx, 33. O. H. Petty: Proc. Path. Soc., Philadelphia, 1914, xvi, 47; also Jour. Am. Med. Assn., 1913, lxi, 1810. W. G. McCallum: Proc. New York Path. Soc., 1915, N. S., xv, 27. J. L. Roberts: Liverpool Med.-Chir. Jour., 1910, xxx, 96. Paul Woolley: Am. Jour. Syph., St. Louis, 1917, i, 426. Laurence Humphry: British Med. Jour., 1910, ii, 1046. Jas. B. Herrick: Case here reported.

and anatomical aspects. Thus, an organic heart lesion, however obtrusive its physical signs, may nowise impair the efficiency of the body in the execution of its daily tasks. Functionally, therefore, it is as if the engine of circulation were perfectly healthy.

But the suspicion must always be entertained that the infective nidus which occasioned the structural change is still alive, and that, under conditions favorable to itself, it may awake to new life, overcome tissue "resistance" and develop a "drive" against which we are powerless to contend.

Therefore the practical medical mind must not only consider the actual mechanical and biological condition of the damaged organ, but must entertain a prevision of what may happen by reason of adverse changes affecting its allies, the various associated activities on which it depends.

The late J. H. Musser[1] took pains to point out that while in works on the practice of medicine a greatly preponderant proportion of the text is devoted to organic diseases, in actual practice at least three-fourths of the disorders the physician is called upon to treat belong to the category of functional diseases.

In even so simple an analogue of the body as the automobile, it is interesting to observe that most of the troubles that impair the efficiency of the machine in no way implicate the structural integrity of its parts. The engine is "killed" as effectually a score of times for lack of adjustment for once that it suffers a mechanical break.

The isolated mammalian heart is a typical engine pump. At a given temperature it works steadily, undisturbed in its rhythm by extreme variations in the load it has to propel or resistance it must overcome. But in its normal environment nothing can happen without awakening its response. Its state is modified by the state of every other mechanism and its final efficiency is determined by the coördination of associated activities.

A luminous illustration of this point of view is to be found in that symptom-complex of physiological insufficiency which the Great War has placed in the limelight and which is commonly designated in this country as "neuro-circulatory-asthenia," in England as "disordered action of the heart," and which Lewis,[2] in a recent monograph, has denominated as "effort syndrome."

The disorder appears to be an all-around functional failure to respond efficiently to effort, and as the organs of circulation and respiration are the great motor agencies of the body, they are incriminated as the deficient mechanisms. The symptoms of breathlessness, tachycardia, palpitation, peripheral congestion, precordial pain, etc., induced by moderate exertion in the victims of this disorder, utterly unfitted them for the strenuous demands of military service.

[1] University Med. Mag., 1892, iv, 685.
[2] The Soldier's Heart and the Effort Syndrome, 1919.

In seeking the etiology of this syndrome it is not strange that the clinician, inbued with the current conceptions of the eerie powers of the internal secretions, should assume at once that this symptom-complex is but a manifestation of induced hyperthyroidism. But the careful observations of Addis and Kerr[3] have shown that enlargement of the thyroid gland plays no part in the manifestation of the disorder. Also, a special analysis made by Lewis[4] certifies that thyroid changes, at least such as justify a diagnosis of Graves's disease, cannot be held to explain the symptomatology. The observant genius of J. M. Da Costa first apprehended the "effort syndrome" in 1862 among the soldiers of our Civil War; since then until recent times consideration of this disorder has not burdened the literature. This lapse of more than half a century has led to a disposition to believe that the production of the effort syndrome is dependent upon war conditions, but there is little doubt that the medical examiner who will take pains to test the physiological reserve power of vital functions will be able to segregate a large proportion of unselected persons in a class belonging to this category. This preliminary discussion is thus prolonged because the present paper is an attempt to show that this class of cases is perhaps the most numerous with which the physician has to deal, and to point out certain simple procedures by which its members may be disclosed and functionally measured.

Lewis[5] states that of some 70,000 soldiers returned to British hospitals on account of cardiac deficiency, approximately only 1 in 10 had actual or structural heart disease. About 57 per cent. of the debilitated had been recruited from sedentary or light occupations in civil life. It is interesting to note that the most salutary treatment for the rehabilitation of these patients was not bed-rest, which was found wholly pernicious, but a systematic course of graduated exercises such as was furnished by drills of increasing severity. Under such a *regimen* "50 per cent. may be rendered fit for full or light duty, while 50 per cent. should remain in the sedentary class or be discharged as unfit." Lewis[6] writes: "The dominant etiological factor in the clinical histories of soldiers complaining of the 'effort syndrome' is infection of one kind or another." It must awaken astonishment that in the table enumerating the various suspected causes of infection the word "tuberculosis" does not occur.

Our drastic experience with the effort syndrome seems to teach anew a lesson: that the welfare of the human organism depends not alone on the integrity of its individual mechanisms but on the teamwork displayed in their activity; that the primary failure of the whole organism is a lapse of coördination in the play of related functions rather than failure in the strength of single parts. It is well-known that the mammalian heart, many hours after systemic

[3] Arch. Int. Med., 1919, xxiii, 316.
[4] Loc. cit. [5] Loc. cit. [6] Loc. cit.

death, may be restored to temporary activity. It is as if death, like the rout of a stampeded army, is due not so much to the failure of mechanical power as to the loss of a physiological morale.

It follows that an estimate of the machine efficiency of the body as a whole demands a definite examination not only of the individual vital organs but of what may be called their biological environment.

THE FUNCTIONAL IMPORTANCE OF INFECTION. Numberless data lead to the inference that cellular metabolism is subject in sign and intensity to every infringing influence. We know that the plane of irritability and the metabolic excursions of protoplasm in any cell are largely regulated by the secretions of a definite group of organs, the endocrine glands. To this universal fact of physiology the medical observer has been constrained to add another fact of analogous import to vital metabolism, and which while constituting but an accident in the life history of the normal cell, is almost as inevitable as death itself; this is, of course, infection. In the study of any animal mechanism by statistical methods we are prone to assume that our averages are made up from individuals who represent merely various grades of physiological efficiency, while, in fact, the variable fact of infection is liable to permeate our material and undermine our conclusions.

No physician needs instruction on the eerie consequence of "focal infections" or "auto-intoxications," how apparently similar conditions may produce opposite vital effects, one toxin, for example, producing vascular hypertension, another hypotension.

For a number of years I have been interested in the study of a class of cases characterized more by obvious quantitative deficiency in vital energy than by definite symptoms of organic disease.

A search for the underlying cause of this functional insufficiency and instability has often, in the absence of "focal" disease, revealed evidence of a specific infection which is usually overlooked by reason of its dearth of organic signs. I have ventured to segregate this class of cases in a definite group under the title of "Occult Tuberculosis."

The subject of this condition may be an adult who apparently completely overcame a temporary outcrop of tubercular symptoms which had been detected in youth. More commonly the clinical subject has had no tuberculosis history and no sound reason can be established for believing that he is in danger of developing clinical tuberculosis. He, or especially she, presents to the medical examiner no gross organic lesion or definite diagnostic perversion of function. The symptoms are chiefly subjective: weakness, malaise, nervousness, neuralgic pain, discontent, indigestion. New methods or remedies are liable to work a gratifying cure today, but tomorrow a still more troublesome perversion crops out. This keeps on until the wearied practitioner chucks his case out of responsible care into the limbo of "neurasthenia."

Functional tests, especially such as will shortly be described in our study of blood-pressure, show imperfect reaction to the strain of effort.

The subject is below par physiologically. Of the utmost consequence in the estimate of such cases is the objective evidence that is to be elicited by auscultation of the lungs and by roentgen-ray photographs of the chest.

Auscultation almost always develops on one or both sides an increase of the normal broncophony, limited to part of an apex or extending from the root of the lung up. A change in the quality, pitch and duration, even to the development of an "echo," of the spoken sound indicates, as I have insisted elsewhere,[7] that a physical change has involved the respiratory tissue, and that, in the vast majority of cases, such change is due to tuberculosis.

The morbid physical signs at the apex may go further and manifest a slightly prolonged and elevated expiratory breath sound or even a slight, dry, inspiratory crackling. A roentgen-ray picture of such a chest demonstrates a morbid anatomy, which, taken in conjunction with the clinical history, cannot but suggest tuberculous infiltration. There are liable to be found in the root shadows areas of density attributable to glandular fibrosis or calcification. There is more or less continuous thickening and increased density of the upper radiations or well-defined isolated reticulations and an occasional dense spot interpretable as an altered bronchial gland.

Probably no one would interpret such a picture as that of active tuberculosis; but the fact remains that these objective signs are, in the writer's experience, prone to be the counterpart of a clinical history of ill-defined morbidity in patients who, tried by the functional tests to be described, are distinctly subnormal in their physiological powers. It is impossible to determine from these data whether the pulmonary infection postulated by the objective signs is the cause or only a concomitant of the clinical symptoms.

Personally, I am constrained to assume, as a pathological entity, a condition of "occult tuberculosis" in which the disease is not progressive, in which the demonstrable lesions are those of healing, but which, nevertheless, supplies a source of toxemia inundating and debasing all the vital powers.

Having thus outlined certain pathological complications which are as inevitable in a series of biological studies as are storms to fair weather in meteorological records, it is easier to apprehend the significance of certain tests of functional efficiency which have been carried out through observations upon human arterial blood-pressure.

I had long been impressed with the importance of noting the postural changes of blood-pressure as an index of physiological condition

[7] H. Sewall: Jour. Am. Med. Assn., 1913, lx, 2027.

and summarized the observations in this Journal.[8] The fundamental work of Crampton[9] in the same field was not then known to me.

The head of pressure in the large arteries is consumed in overcoming resistance of two general sorts. One is relatively constant and outside our control; it consists in the internal friction concomitant with the movement of the blood. The other is essentially variable and depends upon the gravitational relations of the blood columns determined by the posture of the body. When a person who has been lying supine stands erect his blood tends to gravitate to the lowest point and to accumulate in one or another situation exactly analogous to the water of a flowing stream. As so well emphasized by Leonard Hill[10] in experiments on animals, in the feet-down posture, there is a tendency for the heart and brain to be drained of blood which gravitates downward and collects predominantly in the capacious venous reservoirs of the abdominal cavity. In changing from the horizontal to the vertical position a wholly new element of resistance is added to the blood current, that of gravity.

It is evident that in order that the blood supply to the brain and to the heart itself may not be depleted in the upright posture, there must be compensatory aids to the peripheral circulation. Without repeating the evidence already offered it may be dogmatically stated that the gravitational accumulation of blood within the abdomen in the erect posture is prevented not so much by increased energy of blood-flow from the heart as by increase of vascular tone of the splanchnic vessels and of tension in the retaining abdominal wall. A marked fall of systolic blood-pressure in changing from the recumbent to the upright position means that these compensating factors are deficient, and, with a normal abdominal wall, the deficiency must be altogether attributed to the vasomotor system.

It would be difficult to exaggerate the practical importance of this simple test of the efficiency of one of the most sensitive, most widespread and most vital of the mechanisms of the circulation It is not uncommon for the clinical observer to meet subjects whose systolic arterial blood-pressure in the standing posture has a normal value at the beginning of an observation but begins gradually to decline and after a few minutes suddenly slumps to 80 mm. Hg. or less, and the observation must be intermitted at once to prevent the subject fainting dead away. Such a case recently came to me in the person of a young man who had been rejected as a candidate for the aviation service.

The psychic element is greatly involved in the physiological failures, as is witnessed by the statement of the young man in question,

[8] H. Sewall: Am. Jour. Med. Sc., 1916, cli, 491.
[9] New York Med. Jour., 1913, xcviii, 916; Proc. Soc. Exp. Biol. and Med., 1915, xii, 119.
[10] Jour. Physiol., 1895, xviii, 15.

that it was only when he was in the hands of the doctor that he felt faint in the standing posture. It may incidentally be surmised that such a failure of compensation in the person of a flying aviator could easily lead to a fatal fall. I have searched in vain among the records of the experimental examination of recruits as to their fitness for aviation for a definite investigation of the problem from this point of view.

It is a striking feature in most of these cases of extreme fall of blood-pressure in the erect position that the pulse and heartbeat usually become very slow instead of quicker, as might be expected.

Normal Postural Changes in the Blood-pressures. In spite of all the work that has been done on the subject, there is still no general agreement as to the relative values of the blood-pressures in the recumbent and erect postures of the body. The subject is discussed in a former communication.[11] Observations on several hundreds of subjects lead me to the conclusion that in changing from the recumbent to the standing posture there is always a rise in diastolic pressure and a fall in pulse-pressure. That in the normal (and some pathological) cases the systolic pressure does not change materially or shows a rise.

In a great proportion of subjects coming under the physician's eye, however, there is a systolic fall of blood-pressure in the standing posture.

Barach and Marks[12] tested the gravitational effect of postural change in normal subjects supported upon a rotatable board, by means of which the body could be supported erect with the least possible output of muscular exertion. They found in the majority of cases a considerable rise in systolic pressure in the recumbent and a fall in the erect posture, the pulse-pressure usually varying in the same direction as the maximal pressure.

It should be stated that, however interesting such experiments may be, they do not represent the normal conditions in the erect posture, which is maintained by the outflow of motor energy.

Evaluation of the Three Elements of Arterial Blood-pressure. The relative physiological value of the three elements of arterial pressure—systolic, diastolic and pulse-pressures—is of the utmost practical importance.

The clinical significance of this data justifies a brief, though necessarily theoretical, discussion. As regards systolic blood-pressure, it is the measure of vascular strain. The rupture of a weakened arterial wall is probably determined immediately not by a continuous but by a mounting high pressure, such as an elevation of 20 to 30 mm. Hg., which experience shows is prone to accompany even slight muscular exertion or psychic disturbance. The systolic pressure measures the maximal head of power available for driving

[11] H. Sewall: Am. Jour. Med. Sc., 1916, cli, 491.
[12] Arch. Int. Med., 1913, xi, 485.

the blood; when it is greatly in excess of normal, danger of rupture threatens the arteries; when it is greatly below normal no compensating mechanism can supply nutriment to the tissues.

The diastolic blood-pressure is generally admitted to measure the peripheral resistance to the circulation and to be an index of vasomotor tone. The relations of diastolic blood-pressure to the heart itself appear to have been generally overlooked. In his valuable disquisition on the mechanics of the heart, Leonard Hill[13] points out that the heart may be regarded as a hollow sphere, the strain upon whose wall with varying area and a constant intracardiac pressure must follow the law of the hydraulic press. "When the exertion of each individual fiber is taken as constant the fluid pressure per unit area must vary inversely as the cube of the radius of curvature, or, if the pressure be regarded as constant, the exertion of each fiber must vary as the cube of the radius of curvature. . . . If the auricle or ventricle be suddenly enlarged to twice its diameter the muscle fibers must be exerted eight times as much as before to produce the same pressure."

We cannot escape the conclusion that with a given pressure upon the closed semilunar valves the strain endured by the ventricles in overcoming this pressure increases very markedly with increase in the volume of their cavities. It is at the end of the diastolic phase that the volume of the heart is greatest and at which the intraventricular load must be lifted over the aortic resistance.

The outstanding significance of excessive diastolic blood-pressure is that it indicates a burden laid upon the ventricles at a moment when, according to a law of hydraulics, the physical strain endured by the walls of the heart in overcoming the resistance is at a maximum.

Now enters a physiological consideration, which suggests a vital adaptation to the mechanical disadvantage of moderate cardiac dilatation, which is unparalleled in artificial pumps. This consists in the functional relation between muscular power and the length of the contracting fibers.

One of the fundamental experiments in muscle physiology is the demonstration that a skeletal muscle, properly suspended and weighted outside the body and artificially stimulated to contract, is strongest when it is longest. If the muscle is "after-loaded" at definite points in the course of its shortening it is seen that its maximum lift power is exerted at the beginning of the contraction when its fibers are longest, and that the lift power progressively decreases as the fibers shorten. As a corollary to this it is found that a given weight stretches the muscle more when it is active than when it is at rest and that the elongation is greater the nearer to the phase of maximum shortening the weight is applied.

[13] Schäfer's Text-book on Physiology, 1900, ii, 40.

In other words, during contraction of a muscle fiber its contractility decreases but its extensibility increases. If we can apply this law for the contraction of skeletal muscle to the special form of tissue found in the heart, we may deduce certain important conclusions, such as the fact of physiological compensation for the mechanical disadvantage which the heart suffers at the end of diastole by reason of its increased volume and also the immunity the contracting ventricle enjoys from overstrain while maintaining excessive systolic blood-pressure. I ventured some years ago[14] to present these considerations since when they have been essentially confirmed experimentally by investigators in the physiology of the circulation.[15]

Nevertheless, it is obvious that the level of diastolic blood-pressure is the measure of cardiac strain, and we must look upon this factor as a prime determinant of cardiac hypertrophy, of dilatation and of heart failure.

We might be inclined to assume that safety against heart failure is assured in proportion to the lowering of diastolic blood-pressure, but other considerations show that this would be an egregious error. Physiologists have clearly established that the blood-flow through the coronary vessels is determined by the systolic squeeze of the muscles in which they are imbedded. J. B. MacCallum[16] showed that "nearly all (the fibers of the heart) begin in the auriculo-ventricular ring of one ventricle and end in the papillary muscles of the other. Those fibers which begin near the outside of one ventricle end near the inside of the other ventricle." It is believed that, owing to the spiral course of its fibers, the contracting ventricle wrings its cavity and its walls empty much as we wring the water out of a twisted cloth. The blood spurts from the coronary sinus with each systole of the ventricles. If there is thus a periodic emptying of the mural vessels during systole it is obvious that during diastole their supply of fluid must be renewed from the aorta, as Brücke long ago pointed out. The diastolic head of pressure in the aorta, then, is the driving force by which the coronary arteries are filled, and it is a fair presumption that the volume of blood sent into the heart muscle depends primarily on the diastolic arterial pressure, though the completeness of its removal is determined by the vigor of systolic contraction.

There must be a critical point in the diastolic pressure below which the nutrition of the heart must suffer from lack of adequate supply of nutriment, and it is easy to believe that a diastolic fall of pressure might cause such a loss of driving force as would lead to asystole and which could be fatal with degenerated cardiac tissue. The

[14] H. Sewall: International Clinics, 1913, iv, 23d ser., 99.

[15] S. W. Patterson, H. Piper and E. H. Starling: Jour. Physiol., 1914, xlviii, 465. R. Gesell: Am. Jour. Physiol., 1915, xxxviii, 404.

[16] The W. H. Welch Anniversary Volume, 1900, p. 307.

clinician is only too familiar with sudden death in cases of aortic insufficiency, cases which are distinguished by the rhythmic extreme depression of diastolic blood-pressure. These accidents are prone to occur under conditions which favor gravitation of blood into the abdominal vessels, as on assumption of the erect posture after action of the bowels or by prolongation of diastole under digitalis. Such reasoning is justifiable in view of the practical importance of the conclusion to which they give rise, that heart failure is preferably the result of subnormal diastolic rather than of supernormal systolic blood-pressure.

We may even venture upon a generalization that the paramount immediate cause of heart failure is deficiency in the coronary blood supply and that in the great majority of cases the culpable factor is abnormal depression of the diastolic blood-pressure.

Our relative evaluation of systolic and diastolic blood-pressure leads to the conclusion that the former is an index of cardiac energy expended.

It throws no light on the store of reserve power of the heart. Systolic hypertension signifies arterial overstrain the results of which depend upon vascular resilience. Systolic hypotension is a sign of weakness which is prone to result in constitutional evidence of subnormal nutrition.

Diastolic blood-pressure is an index of peripheral resistance to the circulation whose functional regulation is clearly under control of the vasomotor mechanism, but which, also, has intimate relations to the elasticity of the vascular walls and obscure, though probably most important, dependence upon the viscosity of the blood.

Diastolic hypertension signifies undue strain upon the vasoconstrictor mechanism. It is the causal antecedent of cardiac dilatation and hypertrophy. The heart of aortic insufficiency forms a special case which does not invalidate the above.

Diastolic hypotension indicates a low head of pressure in the nutrient stream for the heart; it leads to asystole and its acute onset is probably the cause of fainting and of sudden death.

In a useful article Warfield[17] states that the diastolic pressure registers what one may call the average peripheral resistance, and that a high diastolic pressure invariably means constant increased work on the part of the heart and leads to hypertrophy of the left ventricle; that a gradually rising diastolic pressure is more significant than high systolic pressure; that large pulse pressures are essential for the compensation of hypertension cases, decreasing pulse pressures in such cases is a sign of failing heart; that any pulse pressure below 30 mm. Hg. must be regarded as low, above 50 mm. Hg. as high.

The third element of the arterial blood-pressure which it behooves

[17] New York Med. Jour., 1915, cii, 508.

the clinician to specifically attend is the "pulse-pressure." This is obtained by subtracting, at any moment, the diastolic from the systolic blood-pressure. It represents the volume of the blood wave sent out at each beat of the heart. As will be pointed out later the exact determination of the pulse-pressure is probably impossible to achieve, but working values are easily obtained. The important contributions of Erlanger and Hooker[18] and of Dawson and Gorham[19] and others have shown that, heart-rate remaining the same, the pulse-pressure determines the nutritive supply of the tissues—that there is a direct proportion between the two.

Normal metabolism in every organ demands that the blood stream shall irrigate it in waves exceeding a certain minimum volume. When that organ is the brain it is obvious that we should expect general constitutional symptoms to immediately attend a critical lowering of pulse-pressure in its arterial blood supply. In a personal communication, Erlanger states that a fall of PP. to 10 mm. Hg. is indicative of shock.

It should now be clear that a special field of medical investigation comprises the quantitative measurement of vital phenomena as distinct from their qualitative determination. Disturbed function and vital failure threaten to supervene whenever the energy output is much above or below certain "normal" limits which Nature has determined to mark the range of physiological activity. This study of function has its own value irrespective of the structural condition of the organ to which it appertains. Disturbed function is no proof of structural disease. Organic disease, indeed, is relatively indifferent to the individual except as it interferes with function.

Clinicians are prone to undervalue the importance of quantitative functional efficiency except through some drastic experience such as leads to the study of renal secretion preparatory to operation on the prostate gland, or when its disturbance has been manifested as an "effort syndrome" which depletes the man-power of a nation fighting for life.

THE TECHNIC OF BLOOD-PRESSURE ESTIMATION. My estimations of blood-pressure were all made by the auscultatory method with the use of the simple mercurial sphygmomanometer of Pilling, with a broad cuff. The pressures were taken first with the patient lying supine and later standing erect. The sudden weakening of sound at the end of the third phase was assumed to indicate diastolic pressure. After counting the pulse-rate, from two to four successive auscultatory determinations were made in each posture, after which the systolic blood-pressure was estimated by the tactile method—the obliteration of the radial pulse at the wrist. Perhaps it is worth mentioning that in the recumbent position the arm bearing the cuff

[18] Johns Hopkins Hosp. Rep., 1904, xii, 145.
[19] Jour. Exper. Med., 1908, x, 484.

should be supported paralled with the axis of the chest, otherwise it will drop sensibly below the plane of the heart.

There is a practical complication incident to the auscultatory determination of blood-pressure which has failed to receive adequate attention in the literature; brief discussions by Cook and Taussig[20] and by Tornai[21] are the only definite notices I have seen of the subject. This consists in the occasional total suppression of one or more sound phases. The auscultatory failure of sound is in itself an indication of some radical functional deficiency in the circulation. Such silent phases are encountered with great frequency in the class of patients, those with weak circulation, chiefly treated in this article, but they are also found in the subjects of marked hypertension. Perhaps the commonest locus of sound failure is the so-called fourth phase; but not infrequently the whole of the first phase is absent, especially following an initial "pop" or two representing maximal pressure.

It is obvious, therefore, that determination of maximal blood-pressure by auscultation may be wholly unreliable unless supported by the tactile evidence furnished by obliteration of the pulse at the wrist, in which the maximal pressure commonly falls to 5 to 10 mm. below that obtained by the stethoscope. In certain cases a curious alternation of periods of sound and silence occurs during an observation. A good radial pulse may be maintained while the audible sound phase on the same side rhythmically comes and goes. It is plain, therefore, that tactile perception of the pulse-wave must remain the criterion of its escape from beneath the cuff.

Absence of sound phases rarely occurs during the first observation of a series, but is likely to be marked with subsequent ones. Silent phases are much more frequently encountered in the standing than in the recumbent posture. The phenomenon appears to be intimately related to the venous engorgement of the forearm. When the arterial sound has failed it may be temporarily restored by releasing the cuff pressure and elevating the arm above the head, thus draining the veins.

The form of stethoscope used in auscultation is not indifferent. I have heard sounds by use of the disk instrument of Bowles which were inaudible through the bell of the ordinary Snofton stethoscope. Curiously, the reverse fact has been observed in a case in which the sound was a venous hum in the neck.

Writers are prone to assert that in cases presenting the condition of aortic insufficiency there is no fifth phase—that the arterial sounds persist to the point of no cuff pressure. I find, on the contrary, that many cases of aortic regurgitation present the normal succession of sound phases

On the other hand, not infrequently I have found the sound phases

[20] Jour. Am. Med. Assn., 1917, lxviii, 1088.
[21] Ztschr. f. klin. Med., 1910, lxx, 235.

to persist to the bottom of the mercury column in persons in whom no certain evidence of aortic insufficiency could be detected. Such a phenomenon may occur with the first of a series of observations with a return to normal in later ones, and it is more common in the erect than in the recumbent posture.

Each of my series of observations has consumed fifteen to thirty minutes, or in special cases more than an hour, for reasons which will be obvious in the final section of this paper. The data used have been drawn from 365 series of observations on 250 persons, approximately within the past year and a half.

Significance of Postural and Respiratory Variations in Rate of Heartbeat. It is a matter of general knowledge that the pulse-rate increases on changing from the recumbent to the erect posture. The elevation in heart-rate in the standing as compared with the recumbent posture is subject to wide variations in the normal individual. The average increase of beats may be taken as twelve to fourteen per minute.[22]

An impressive result of such experiments as will be detailed is that patients suffering from cardiovascular disease may show remarkably slight change of rate with posture.

Finally, there may be mentioned a rhythmic variation in heart-rate which has no essential relation to posture. It is characterized by James Mackenzie[23] as the "youthful form of irregularity." It consists in a rhythmic quickening of the heartbeat during inspiration and a slowing during expiration. The current explanation of the phenomenon would seem to attribute it to influences acting on the cardiac centers in the medulla.[24]

I venture, however, to recall in this connection experiments carried out with the aid of F. Donaldson[25] in 1882 and whose results had been anticipated by Ludwig and Luchsinger.

On the isolated heart-vagus preparation of the terrapin supplied by an artificial current of blood we proved that the inhibitory effect of vagus stimulation was lessened by rise of intracardiac pressure produced by increasing the rate of inflow of blood. Elevation of the supply flask by 2 or 3 c.c. had an obvious effect in diminishing the cardioinhibitory effect of a definite strength of stimulating current. Moreover, the vagus effect was found to be limited to variations of pressure within the venous sinus or sinus and auricles; that is, it depended upon stretching of the tissue in which orginate the impulses to contraction. Now, under normal conditions there is increased flow of blood into and distention of the right auricle during inspiration.

[22] Vierodt: Daten u. Tabellen f. Mediziner, 1906, p. 235.
[23] The Study of the Pulse, 1902.
[24] Cf. J. Erlanger and E. G. Festerling: Jour. Exp. Med., 1912, xv, 370.
[25] Jour. Physiol., 1880–1882, iii, 357.

Even though, as most authors assume,[26] there be a diminution of right-sided intracardiac blood-pressure during inspiration, the stretching of the cardiac tissues and mechanical stimulation of their contained nerves must be proportional to the volume of contained blood. We have here, then, experimental evidence of a rhythmic depression of tonic cardio-inhibitory impulses and consequent acceleration of heartbeat during inspiration.

Another point worth noting is that in those cases of circulatory insufficiency in which actual fainting is threatened through "blood ptosis" in the standing posture, there is usually not a rise in pulse-rate, as might be expected, but a very marked slowing.

Diagnostic Value of the Postural Changes in the Blood-Pressures. Numerous and instructive methods have been devised for the clinical estimation of the functional efficiency of the heart. It can hardly be disputed that, as far as appreciation by the practical clinician is concerned, these methods mostly sojourn in the academic scrap-heap.

In his examination of a patient the doctor is guided by his conception of the ratio of effort to use; necessity not luxury determines his technic; the burden of a new method is intolerable unless it yields very practical results and fits easily into the routine of examination.

It is worth insisting on the conception that the efficiency of the circulation or the life and welfare of a patient with a cardiovascular disease, no more depends upon heart-power than upon a number of functions associated with it.

The excessive gravitation of blood into the limbs and belly when a person stands erect does not predicate heart disease, but does prove inefficiency of the circulation, which, for the individual, is the important thing. A certain man, aged sixty years, with dilated and probably degenerated heart muscle, manifested a fall of arterial pressure of 20 to 30 mm. Hg. on rising from the recumbent posture. One morning he sat up on the side of the bed and fell dead. The plain interpretation of the accident attributes it to blood ptosis resulting in such critical lowering of his aortic diastolic pressure that the coronary circulation ceased. Had the heart not been diseased the result would no doubt have been a temporary fainting fit. It is the possibility of such accidents that makes it important to determine the organic integrity of the heart in slight ailments and indicates caution in permitting postural changes, and especially going to stool on the part of certain cardiac patients.

The pioneer work upon the postural changes in the arterial blood pressures appears to have been presented in the important contribution of Erlanger and Hooker[27] fifteen years ago. They introduced the useful term "pulse-pressure" and first insisted that conclusions

[26] T. Lewis: Jour. Physiol., 1908, xxxvii, 213. [27] Loc. cit.

of value could only be drawn from blood-pressure determinations by taking into account both minimal and maximal pressures. In the careful study of a case of orthostatic albuminuria they showed reason for believing that the renal symptom was dependent on lessened pulse-pressure in the standing posture (it must not be concluded from this that lowering of pulse-pressure necessarily entails albuminuria).

In a lengthy discussion of the significance of pulse-pressure they concluded that under anything like normal conditions the pulse-pressure was a reliable index of ventricular output and that the product of PP x PR (pulse-pressure into pulse-rate) represents the velocity of the blood current and therefore the nutritive supply to the tissues. In an experimental research upon this problem, Dawson and Gorham[28] were later led to the conclusion that "Under normal conditions and during various procedures (namely, stimulation of the vagus centrally and peripherally, of the saphenus nerve centrally, and of the annulus Vieussentis, intravenous transfusions of 0.7 per cent. sodium chloride solution, intra-arterial transfusion of strong carbonate, bleeding and asphyxia) the pulse-pressure is a reliable index of systolic output."

In view of such work we must deprecate statements without evidence, like that of Warfield, that "Pathological changes in the heart or bloodvessels make this formula (PP x PR) of no value."

In the normally functioning subject there is, as has been pointed out, on rising from the recumbent to the erect posture but little change or (usually) an elevation of systolic blood-pressure, a constant rise of diastolic pressure and a slight fall in pulse-pressure. Comparison of the blood-pressures in the recumbent and the erect postures gives us an unrivalled opportunity of estimating the efficiency of the vital mechanisms which compensate for the gravitational resistance to the circulation. An important addendum to the signs of vascular strain in compensating for the resistance of gravity is to be found in the increase in the heart-rate in the erect posture. Crampton[29] has ingeniously constructed a table representing postural changes in circulation efficiency through the combined vascular and cardiac elements.

As might have been predicted from the foregoing considerations, the postural observation of the blood-pressures has its main use in the detection of functional cardiovascular insufficiency. The victims of this condition are miserable by reason of physical weakness and nervous instability. There may be local signs, as headache, dizziness or tinnitus in the erect posture.

The class comprises a very large proportion of the patients who visit a doctor's office. Such persons habitually manifest low arterial

[28] Loc. cit. [29] Loc. cit.

pressures, there often being a marked fall (15 to 20 mm. Hg.) in the systolic pressure in changing from the recumbent to the standing posture. Further evidence of vasotonic weakness is given by the continued subsidence of systolic pressure, as observations are continued in the standing posture, so that after ten to fifteen minutes the patient complains of fatigue or faintness. For such victims of blood ptosis no treatment seems so immediately effective as the support of a good abdominal belt. It is interesting to note that after such support has been afforded for a few weeks the belt may sometimes be dispensed with with comfort for considerable periods.

It not infrequently happens that the history of a patient leads to the prediction that evidence of blood ptosis will be found, but on taking the blood-pressure nothing of the sort is shown. Nevertheless, though the systolic blood-pressure may show no fall in assuming the erect posture the diastolic pressure undergoes an inordinate rise, leading to an abnormal drop in the pulse-pressure. Indeed, as far as numerical values of the elements of the blood-pressure serve as an index of physiological efficiency in the absence of gross organic lesions the pulse-pressure, in my experience, is the one invariable determining factor. When there are symptoms of circulatory insufficiency there will usually be found a subnormal pulse-pressure, and when the erect posture is assumed there will be an inordinate decrease in the value of the pulse-pressure to levels of 25, 20 or even 10 mm. Hg.

In 100 cases in which the pulse-pressure was low, 30 mm. Hg. or less, in the standing posture, the predominant cause of the fall of pulse-pressure was fall of systolic pressure in 10 cases; rise of diastolic pressure in 69 cases and combined fall of systolic and rise of diastolic pressure in 21 cases.

Further investigation of such circulatory abnormalities will usually, if not always, establish the existence of some focal infection such as is liable to occur in connection with the teeth or the tonsils and the removal of which I have seen followed by a return of the vascular conditions toward normal. The well-nigh ubiquitous influence of "occult tuberculosis" has already been referred to. In the choice of quickly acting remedial measures for this cardiovascular insufficiency, I have found, contrary to common advice, that the exhibition of 10 to 15 drops of the tincture of digitalis t. i. d. often does good.

Oliver,[30] in his interesting work, properly advocates recumbent rest after meals, with exercises, etc., directed to the increase of muscular tone, especially in the abdominal wall.

The points which have been advanced may be made clearer by a brief analysis of the paradigms of a few actual observations.

[30] Blood and Blood-pressure, 1901, p. 270.

BLOOD-PRESSURES.

Case No.	Sex.	Age.	Lying:					Standing:				
			SP	PR	DP	PP	PP x PR	SP	PR	DP	PP	PP x PR
1 *a*	M.	46	107 104	80 TP = 102	67 67	40 37	2680	100 99 98	120 TP = ?	76 80 77	24 19 21	2556
1 *b*	M.	..	97 96	76 TP = 95	60 60	37 36	2774	87 84	120 TP = 77	63 67	24 17	2460
2	F.	26	112 112	80 TP = 107	62 62	50 50	4000	119 113 103	100 TP = 102	75 80 80	44 33 23	3333
3	M.	28	125 122	88 TP = 115	72 74	53 48	4440	95	120 TP = 85-65	76	19	2280
4 *a*	M.	59	122 118	72 TP = 115	62 65	60 53	4068	111 108	100 TP = 107	76 75	35 33	3400
4 *b*	M.	..	132 132	84 TP = 130	62 66	70 66	5712	125 120 99	112 TP = 95	75 68 65	50 52 34	5712 5040
5	M.	36	123 123	88 TP = 120	80 78	43 75	3872	122 120 123	104 TP = 118	88 110 108	34 10 15	2048
6	F.	14	97 97	80 TP = 92	62 63	35 34	2760	107 103	104 TP = 102	80 90	27 13	2080
7	F.	53	107 108	68 TP = 105	72 75	37 33	2380	115 116	80 TP = 113	95 95	20 21	1640
8	M.	40	109 109	68 TP = 105	71 71	38 38	2584	108 109	100 TP = 106	90 90	18 19	1850
9	F.	39	103 103	60 TP = 100	63 65	40 38	2160	109 93	92 TP = 93	82 78	27 15	1932
10	F.	42	125 125	90 TP = 122	68 70	57 55	5040	117 117	120 TP = 117	88 90	29 27	3360

In the table the blood-pressure data are given for the two postures, lying supine and standing. As for the lettering, SP represents systolic pressure; DP, diastolic pressure; PR, pulse-rate; TP, tactile pressure, determined by obliteration of the pulse at the wrist.

The column PP for each posture gives the pulse-pressure and the columns PP x PR give the product of pulse-pressure by pulse-rate, which measures the circulation velocity or irrigating volume. These latter figures were obtained by multiplying the average pulse-pressures for each posture by the corresponding pulse-rates.

The first case, 1 *a* and 1 *b* is that of a man who probably belongs to the class of occult tuberculosis. His complaint was of bodily weakness and general goodfornothingness. No active organic trouble could be detected except marked suppuration of his tonsils—they were riddled with pus.

He was referred to a throat specialist, who subjected him to extensive manipulation of his tonsils. In forty-eight hours the patient returned and the record 1 *b* was made. His condition then was most miserable from physical exhaustion, mental depression, lack of courage and initiative. He could not be persuaded to submit to operation. The physical basis of his asthenia is well demonstrated in his low systolic and pulse-pressures and by the inadequate rise of diastolic pressure standing.

Case 2 is that of an unmarried woman with high palatal arch, a typical "neurasthenic," but possessing unusual moral and mental vigor. When she stood up the circulation remained normal for a brief interval, but soon the systolic pressure began to fall and with it the pulse-pressure. She probably would have fainted had the observation been continued a few minutes longer. We have here evidence of blood ptosis due to gradual relaxation of her splanchnic vasomotor grip. The patient improved greatly under support of an abdominal belt. This case is typical of a very large class of asthenics.

Case 3 is that of a man suspected of active pulmonary tuberculosis. He gives a luminous illustration of vasomotor insufficiency and blood stagnation in the erect posture. I did not venture to keep him standing. Incidentally, the observation shows how utterly worthless for diagnosis a blood-pressure in the recumbent position alone may be.

Case 4 illustrates a remediable focal infection. It is that of a farmer who sold his property because of physical exhaustion, loss of weight and dyspeptic symptoms. Careful roentgen-ray study of the digestive organs excluded evidence of organic lesion there.

Pyorrhea and disorder of the teeth put him into the hands of the dentist. After some weeks his sense of well-being was completely restored. Observation *a* was made before treatment and *b* afterward. They show the numerical differences between a weak circulation and a strong one. It will be noted that in the standing posture of the

4 *b* observation the third systolic pressure has dropped from 120 to 99 mm. Hg. and the tactile pressure to 95 mm. This was after the patient had already been standing erect fifteen to twenty minutes. His powers of compensation had become overstrained; he had still far to go in the development of normal strength.

The foregoing cases illustrate abnormal lowering of pulse-pressure through fall of systolic pressure in the erect posture. The same influence on pulse-pressure is still more commonly exerted by abnormal elevation of diastolic pressure, as shown in Cases 5 to 8. As has already been indicated the most important single sign of circulatory efficiency is magnitude of the pulse-pressure. This quantity may be reduced by fall of SP or rise of DP or both combined. I am inclined to believe that important clinical deductions are potential in the differentiation of these classes. Presumably a mere drop in systolic pressure indicates vital failure, specifically of the vasoconstrictor mechanism and incidentally of cardiac energy.

But, contrariwise, an inordinate rise of diastolic pressure is evidence of a spasm of the vascular apparatus—of a strain which is excessive possibly because not properly supported by corresponding increase of cardiac energy. The vital picture here is that of a heart dilating with undelivered blood and of a vasomotor system overstrained by reason of vascular underfilling.

It may be that herein lies the explanation of the great improvement I have sometimes noted in these cases through the administration of digitalis. At all events, it is obvious that the pathological conditions leading to vasomotor exhaustion on the one hand and to vascular spasm with cardiac failure on the other deserve to be discriminated. In the subsequent section of this paper direct evidence will be offered as to the play of vascular spasm under the stress of effort.

Case 5 is that of a dentist who had recovered from tuberculosis. Infection of a finger had necessitated removal of glands from an arm. Various symptoms had led to diagnosis of and treatment for intestinal stasis. He was incapable of sustained effort and was mentally nervous and miserable. His blood-pressure in the recumbent posture was normal, but on standing there was an inordinate rise of diastolic pressure and fall in pulse-pressure, giving a physical explanation of his nerve-muscle failure.

Case 6 is that of a fairly robust young girl whose mother was a tuberculosis cure and who herself showed a roentgen-ray plate indicating latent tuberculosis. She presented orthostatic albuminuria; the low pulse-pressure while standing is noteworthy. On another occasion she almost fainted after a few minutes in the erect posture, owing to fall in systolic pressure.

Case 7 is that of an unmarried woman the victim of various miseries of a nervous character. Note the abnormal rise in diastolic pressure and fall of pulse-pressure in the standing posture.

Case 8 is that of a fairly vigorous looking man who pursued his clerical duties with difficulty on account of complete exhaustion attending the erect posture. Note the rise of diastolic pressure and fall of pulse-pressure on standing.

All these patients presented normal blood-pressures in the recumbent posture, but on submitting them to the strain of standing each developed a numerical fall in systolic or rise in diastolic pressure resulting in abnormal lowering of pulse-pressure. Such is the objective picture of cardiovascular conditions that I have found constant in scores of persons who belong to the most numerous class of functionally deficient patients who visit the "general practitioner."

Finally, the cases in which fall of PP in the erect posture is due both to fall of SP and rise of DP can be explained as results of combined cardiac weakness and vascular spasm.

Cases 9 and 10 show low pulse-pressures in the erect posture from combined lowering of systolic and rise of diastolic pressure.

Case 9 was that of a rather neurotic school teacher pulled down by anxiety and by suffering incident to a simple rectal operation.

Case 10 represents a woman of great mental activity who had recovered from pulmonary tuberculosis—who had ptosis of the abdominal viscera and myocarditis. Her life and work were tolerable only through the support given by a properly devised corset.

Exceptionally it is found that a person claiming to be well manifests in the erect posture a fall in pulse-pressure to 25 mm. Hg. or lower. When this has occurred in my experience I have been convinced that an undesirable strain was present, but compensated with avoidance of pathological symptoms.

Posture as a Determinant of Circulation Velocity. Thus far no mention has been made of the data contained in the columns headed PP x PR. As has been stated the product obtained by multiplying the pulse-pressure by the pulse-rate is supposed to represent the velocity, that is the irrigating efficiency, of the circulation. If this is true, as experimental evidence indicates, this product would seem to be one of the most important data that could possibly be desired for estimating the effective work accomplished by the engines of the circulation.

In their experiments, upon two subjects, one of whom was an albuminuric of the orthostatic type, Erlanger and Hooker[31] found that the product representing blood movement was sometimes greater in the recumbent than in the erect posture, sometimes the reverse. They take pains to point out that in no case was there great discrepancy in the figures representing circulation velocity in the two postures. A glance at the columns headed PP x PR in my table will show that in every case the blood velocity in the

[31] Loc. cit.

recumbent posture was considerably in excess of that manifested while standing. Indeed, in Case 3 there was a falling off of more than 51 per cent. in the blood movement when the patient stood erect. It seems at first blush a manifest absurdity that the velocity of blood movement should increase when the body is in repose as contrasted with a state of comparative activity; but further examination leads to some interesting practical deductions which are so weighty as to be worthy of rigid investigation.

The class of people treated in this paper is admittedly chiefly composed of persons manifesting pathological symptoms caused by functional insufficiency of the circulation. In the few normal persons or those approaching normal, whom I have examined the product PP x PR is usually greater in the standing posture. It might be thought that the method would find its criterion of reliability in the discrimination between cases with and without organic heart disease. On the contrary the product PP x PR appertains solely to function. In a small series of 8 cases of cardiovascular disease I found that with good compensation, with one apparent exception, the product was greater in the erect than in the recumbent posture; the reverse was true in proportion to the decompensation. It should be observed that the absolute value of the product increases and therefore may be of diagnostic significance in cardiovascular disorder.

The foregoing considerations seem, at least, to demand a definite inquiry into the fundamental question whether circulation efficiency is actually determinable by the postural changes in blood velocity as indicated by the product PP x PR.

In the normal subject or in cases of well-compensated organic disease the ratio is near unity or exhibits an excess of work done in the erect posture. In cases of functional circulation-inefficiency or in a decompensated cardiovascular disease, as far as my experience shows, the reverse is true and the relative decrease of velocity in the erect posture is somewhat proportional to the disability.

This conception throws light from a new direction upon the fundamental clinical experience that in certain active disorders, as tuberculosis, rest in the recumbent posture has a remedial value unparalleled by any other method of treatment.

II. The Secondary Waves of Arterial Blood-pressure.

Every student in physiology has seen demonstrated on animals the three undulations of maximal arterial blood-pressure which are, respectively, caused by the heartbeat, the respiratory movement and variations in peripheral resistance or vasomotor tone (Traube's waves).

The first of these, due to the rhythmic output from the left ventricle, ceases only with life and may be called primary. The others are secondary and vary in magnitude with the depth of

breathing or with the amplitude of the oscillations of vasomotor tone. It is probably correct to assume that millions of readings of the sphygmomanometer have been made without perception of the existence of such waves in the human being.

The monographs devoted to the study of blood-pressure ignore this phase of the subject or consider it only as of academic importance. Even the journal literature is relatively scant in this field of observation.

Studies conducted through a considerable number of years constrain the writer to assert that the secondary waves of blood-pressure are practically always to be discerned in estimations of the systolic blood-pressure by the auscultatory method. So plain is the phenomenon, at least as regards the occurrence of the respiratory waves that, once having observed it the ear can hardly fail to note the rhythmic ebb and flow of "pops" at the beginning of the "first phase."

It may be assumed that no such constant phenomenon in the play of a vital mechanism can be unworthy of study or without physiological or especially pathological importance. The main object of the following observations has been to attempt an evaluation of the secondary waves of blood-pressure as a basis for an estimate of the state of mobilization of the mechanisms, respiratory and vasomotor, which are indispensable allies of the cardiac function. As was indicated at the beginning of this paper, it may well be that a study of these subsidiary phenomena will convey to the clinician earlier diagnostic and prognostic information of the vital status of his patients than observations upon the heart and vessels themselves.

Comparatively few of my subjects manifested organic disease of the heart, arteries or kidneys. Most of them complained of symptoms of "functional" origin or belonged to the class I have described under the title of "occult tuberculosis"; a few would be regarded as "normal." The observations were carried out as already described, blood-pressures being taken first in the recumbent then in the standing posture. The patient was told to relax and make no conscious effort.

The disk of a "Bowles" stethoscope was held by an encircling band upon the artery at the bend of the elbow. After recording the rate of the pulse the air-pressure within the cuff was raised until it just exceeded the maximal arterial pressure. The pressure was then slowly released until the first "pop," indicating the escape of blood from under the cuff, was heard. Note was taken of the phase of respiration at which this occurred and the pressure was held at this point through at least one full respiratory movement. The pressure being gradually lowered it was easy to trace the respiratory sequence of the events of the "first phase," and with fingers on the radial artery one could be assured whether

the auscultatory signs indicated the true systolic pressure. After several observations made in this way a tactile estimate of blood-pressure was made at the radial artery. The patient was then made to stand at ease, the instrument was lifted to a higher support and the whole series of observations was repeated.

Anyone can convince himself that, in the great majority of cases, the maximum of blood-pressure moves up and down with the rhythm of the respiration. Nothing is easier than to determine the exact phase of the respiratory movement in which the first "pop" of the first phase is heard, to read the level of the mercury column corresponding to it and thus obtain the maximal blood-pressure. It is therefore astonishing to note the variety of views entertained by various observers concerning the point upon the respiratory curve which corresponds with the maximal blood-pressure.

Thomas Lewis,[32] who summarizes the literature antedating his own work, explains the discrepancies as follows: "In man a deep intercostal inspiration, which is not prolonged, yields a pure fall of blood-pressure. A deep diaphragmatic inspiration, which is not prolonged, gives a pure rise of blood-pressure. The rise in blood-pressure in abdominal breathing is due to raised intra-abdominal pressure. It follows that many of the recorded inspiratory rises of blood-pressure in man are due to diaphragmatic breathing."

Erlanger and Festerling,[33] who used the graphic "oscillatory" method familiar in the instrument devised by the former, speak in no uncertain terms as follows: "The arterial blood-pressure falls during inspiration and rises during expiration whether the breathing is normal (slow or fast), abdominal or thoracic." Weysse and Lutz[34] later reached the same conclusion with the use of Erlanger's sphygmomanometer.

Foley, Coblentz and Snyder[35] have carried out the only work, apparently, that closely followed the objects of the present research. These authors, however, instructed their subjects, mostly young men, to breathe deeply and slowly during the estimation of their blood-pressures. They accordingly obtained extraordinary differences in the values of their maximal blood-pressures dependent on respiratory movement. A quotation from their paper will serve to indicate in general the method and results I am attempting to describe. "During a decompression experiment the level at which the first few sounds are heard (or at which the period of sounds is first introduced) must be the level of the highest systolic pressure during a respiratory cycle. This may be called the *maximum respiratory systolic pressure*. When, upon further decompression, the sounds are constant for the first time throughout the whole of the

[32] Jour. Physiol., 1908, xxxvii, 232.
[33] Loc. cit.
[34] Am. Jour. Physiol., 1913, xxxii, 477.
[35] Am. Jour. Physiol., 1916, xl, 554.

respiratory cycle the level of the lowest systolic pressure is reached. This pressure may be called the *minimum respiratory systolic pressure.*" These authors habitually found the range between the highest and lowest systolic pressures in the same subject to reach the extraordinary values of 20 to 40 mm. Hg.

In my work care was taken that there should be no voluntary deepening of the breathing, and the average figures are much lower and their fluctuation would seem to have a diagnostic value.

Foley and his collaborators investigated also the respiratory variations of the diastolic blood-pressure, with the resulting conclusion that with deep breathing the ordinary pulse-pressure increased from 19 to 85 per cent. These authors found that the maximum systolic blood-pressure could correspond either with the inspiratory or expiratory phase of respiration, but that the more common result was inspiratory maximal blood-pressure.

My own findings in this particular agree most positively with those of Erlanger and Festerling,[36] that the maximal blood-pressure coincides with the phase of expiration, most commonly with the beginning of the expiratory pause. In several examples out of hundreds of observations there was no respiratory difference between the maximal pressures, and, in a few cases, there was a tendency for the maximal pressure to coincide with inspiration, but no positive records illustrating this condition could be obtained. As a possible explanation of the discrepancy between the findings of different authors, attention may be again directed to the occurrence of silent phases in the gamut of blood-pressure sounds which is particularly frequent in functional weakness of the circulation. When the first sound during decompression is heard at 110 mm. Hg., for example, while the radial pulse below the cuff can already be felt at 115 mm. Hg., it is obvious that the auscultatory finding is worthless as an index of maximal blood-pressure. Every conclusion as to the auscultatory systolic range of arterial pressure should be checked by the tactile evidence of the radial pulse.

Persons differ greatly in the respiratory range of maximal blood-pressure. Although the effect of breathing is primarily due to the rhythmic variation in the volume of blood accommodated by the lungs, it must not be supposed that this mechanical factor is the only one concerned. It is worth noting, however, that in patients subject to bronchial asthma the respiratory variations in maximal pressure are characteristically great, and this fact may be of diagnostic worth in estimating the bronchial component in certain syndromes, as that of hay fever. If decompression is carried out very slowly, pausing during one full respiration with every fall of 1 or 2 mm. in the mercury column, the first pops to be heard commonly occur about the end of expiration and, with falling pressure,

[36] Loc. cit.

gradually extend up the limbs of the respiratory curves (see Figs. 4 and 5) toward the crest which marks full inspiration. Decompression may proceed to the extent of but 1 to 3 mm. Hg. before the

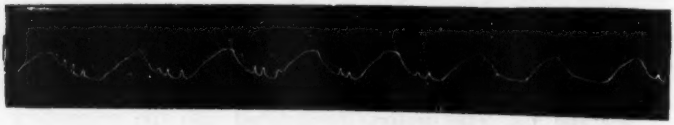

FIG. 1 *a*.—110 mm. Hg.

FIG. 1 *b*.—95 mm. Hg.

FIG. 1.—Tracing from a girl, aged twenty years, with chronic, stationary pulmonary tuberculosis. Cuff pressure in *a* is 110 mm. Hg. It is seen that a few pulse sounds are heard at the end of each expiration, then two respirations occur without arterial sounds: that is, the maximal systolic pressure had dropped temporarily below 110 mm. Hg. After various fluctuations the maximal pressure fell far, so that at 95 mm. (tracing *b*) still no arterial sounds were heard for a considerable period, then the pressure rose rather abruptly and pulsations are heard throughout the respiratory cycle.

FIG. 2 *a*.—180 mm. Hg.

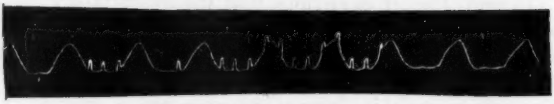

FIG. 2 *b*.—180 mm. Hg.

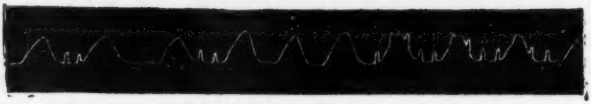

FIG. 2 *c*.—180 mm. Hg.

FIG. 2.—Case of compensated cardiovascular-renal hypertension in a woman, aged fifty-seven years. The cuff pressure is 180 mm. Hg. The respiratory and "vasomotor" variations of maximal systolic pressure are shown.

full succession of pulse sounds is heard throughout the respiratory cycle. Usually the mercury column must drop 5 mm. Hg. from its height at the first pop to that at which a full series of sounds is heard.

FIG. 3 *a*.—190 mm. Hg.

FIG. 3 *b*.—190 mm. Hg.

FIG. 3 *c*.—190 mm. Hg.

FIG. 3.—A physician, aged sixty-eight years, with marked hypertension without renal disease. The cuff pressure is 190 mm. Hg. The patient dozes while under observation and the amplitude of respiratory movement rhythmically varies. The subject's slumber seems deeper when his respiration is shallow. At these periods his systolic pressure has dropped below 190. Each series of more vigorous respirations is initiated by a strong heartbeat which raises the pressure over 190 mm. Hg. The tiny undulations of the respiratory curves are artefacts, due to transmission of cardiac pulsation to the chest wall.

FIG. 4 *a*.—95 mm. Hg.

FIG. 4 *b*.—100 mm. Hg.

FIG. 4 *c*.—105 mm. Hg.

FIG. 4.—Tracings from a healthy woman, aged thirty years. Tracing *a*, taken at 95 mm. Hg. pressure, shows regular pulsations throughout each respiratory curve; *b*, pressure 100 mm. Hg. and *c*, pressure 105 mm. Hg. are self-explanatory.

With normal breathing it is not uncommon to find the maximum and minimum respiratory systolic pressures to differ by 10 or even 20 mm. Hg. The difference is liable to be much more marked in the erect than in the recumbent posture. In such cases it becomes of practical importance to decide upon a criterion of systolic blood-pressure. Neither the maximal nor the minimal systolic pressure represents the truth. It has been my practice to take the minimum systolic pressure in estimating the pulse-pressure, though obviously the mean systolic pressure should be calculated in special cases. When we consider that the diastolic blood-pressure undergoes similar respiratory undulations, and that our clinical estimation of systolic and diastolic pressures cannot be made simultaneously, it is obvious, as stated in a preceding section, that determinations of the pulse-pressure are crude approximations of the truth.

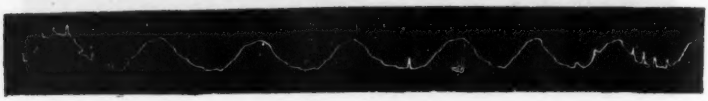

FIG. 5 *a*.—118 mm. Hg.

FIG. 5 *b*.—115 mm. Hg.

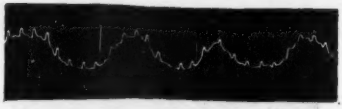

FIG. 5 *c*.—110 mm. Hg.

FIG. 5.—Normal medical student, aged twenty-two years. *a* (cuff pressure 118 mm. Hg.) shows how curiously the maximal pressure is elevated during one respiration. The tiny undulations in the first four respirations curves are artefacts; *b* is taken with cuff pressure at 115 and *c* at 110 mm. Hg.

It may be said that with care in palpating the radial artery it will be found that the respiratory range of systolic blood-pressure, so obvious by the auscultatory method, can be verified by the tactile procedure. It is worth noting that the amplitude of the oscillations in the mercury column is generally proportional to the loudness of the arterial sounds and to the size of the pulse at the wrist.

This subject will be allowed to rest with the observation that the respiratory changes of blood-pressure present a fallow field in clinical pathology that is well worth working.

VASOMOTOR AND OTHER SECONDARY VARIATIONS IN ARTERIAL BLOOD-PRESSURE. It remains to consider other variations of

systolic blood-pressure which cannot be due to respiratory movement, since their rhythm is slower.

The waves which they would make upon a blood-pressure tracing vary enormously in length from crest to crest, their period varying from a few seconds to many minutes. The amplitude of these waves, or distance between crest and trough, may easily indicate a range of pressure of 25 to 30 mm. Hg.

The depth of the waves is apt to be greatly exaggerated in the erect posture.

I am distinctly of the opinion that their prominence is a sign of physiological effort, and that they have a diagnostic worth, for they are most in evidence in a definite clinical type of cases. Perhaps the clearest characterization of this class would group its members as neurotics. They suffer from functional instability which makes sustained effort difficult and exhausting. The evidence indicates that the ebb and flow of energy which produces these waves is sometimes synchronous with the respiratory movements.

The waves in question can easily be detected by producing a cuff pressure somewhere within the range of systolic blood-pressure and holding the mercury column at that point. It will usually be perceived that more or less slowly alternating periods of sound and silence ensue. The depth of this secondary wave is determined by the distance on the mercury column between the highest maximum blood-pressure and that at which the auscultated sounds accompany each heartbeat. In a recent case the maximum blood-pressure was 125 mm. Hg., but, after the advent of fatigue standing, at 100 mm. Hg., the sounds rhythmically disappeared for periods of several seconds; at the same time the pulse failed at the wrist and the oscillations of the mercury column nearly ceased.

With our present knowledge the disposition is to explain these fluctuations of arterial pressure as due to rhythmic variations in the activity of the vasomotor nerve centers. The matter may not be so simple. In 1901 Bayliss[37] described rhythmic contractions and dilatations in the vessels of a pithed and perfused frog. The same author later proved that the muscular coats of living arteries definitely respond to variations of internal pressure, contracting with increase and relaxing with diminution of the stretching force.[38] There is also evidence, as pointed out by Lewis[39] as a new fact, that rhythmic variations in the amplitude of heartbeat, and consequently of systolic output, may cause great rhythmic changes in blood-pressure. An obvious cause of such cardiac variability may be found in mechanical impediments to movement of the heart. Thus a patient whose blood-pressure showed secondary waves of this kind of extraordinary amplitude had a few months before sur-

[37] Jour. Physiol., 1900–1901, xxvi, 21.
[38] W. M. Bayliss: Jour. Physiol., 1902, xxviii, 220.
[39] Loc. cit.

vived an attack of pneumonia, and when examined presented strong clinical evidence of the presence of pleuropericardial adhesions on the right side. Considering the frequency of this pathological sequence to thoracic disease and the marked effect which traction upon the pericardium has upon blood-pressure in the experimental animal, it is clear that in certain cases, at least, blood-pressure variations may have their origin in the heart itself.

A further source of extensive rhythmic and comparatively rapid variations in blood-pressure may possibly be found in fluctuations in the volume of the circulating fluid. The important work of Bogart, Underhill and Mendel[40] demonstrated that the tissue spaces provide a potential reservoir between which and the blood stream there may be rapid and extensive exchange of fluid. They found that "complete restoration of the original blood volume takes place within thirty minutes after the intravenous injection of a quantity of saline solution equal to the calculated blood volume of the animal. . . . The tissues act as a reservoir for this fluid. . . . The capacity of the tissues of rabbits to absorb fluid is approximately four times the normal blood volume of the animal."

Finally, another possible cause of rhythmic alterations in blood-pressure, though at present wholly theoretical, is potentially of the first importance; this is the viscosity of the blood. Its field of action may ere long include much of what we know as physiology.

After all is said, however, we must still hold the view that rhythmic variation, in the intensity of discharge from the vasomotor centers is the common cause of the longer waves in arterial blood-pressure.

Graphic Representation of the Relations of Pulse and Respiration. It is obviously desirable that objective evidence be offered for such assertions as have been made as to the relations of the primary or pulse wave to the secondary waves of systolic blood-pressure.

For this purpose graphic tracings were made of the respiratory movements of persons, usually in the recumbent posture, under investigation. A tambour of appropriate design was laid upon the chest and held in place by an encircling tape. The chamber of this instrument was joined by a rubber tube with that of a small recording tambour whose lever wrote upon a moving smoked surface. Ascent of the curve indicated inspiration and descent expiration. With the sphygmomanometer and stethoscope arranged as have been described, air-pressure within the cuff was raised until arterial sounds were obliterated, and then, with the eyes of the observer on the mercury column and the tube connecting the tambours held between a thumb and finger, decompression was slowly effected. and as each arterial sound came through the tube was sharply

[40] Am. Jour. Physiol., 1916, xli, 189.

pinched, thus marking upon the respiratory curve an abrupt elevation for each sound. The method is open to obvious objections, but it sufficiently accomplishes the object in view.

Summary and Conclusions.

1. This is an essay to demonstrate anew the clinical importance of tests to determine the quantitative range as contrasted with the qualitative perversion of physiological functions.

2. Changing the position of the body from the recumbent to the erect posture throws upon the organs of circulation a definite strain determined by the gravitation of blood. The physiological reaction to this strain is manifested, aside from the heart-rate, by modification of the blood-pressures. Excessive fall of systolic blood-pressure in the erect posture indicates weakness of vasomotor control. Excessive rise of diastolic pressure denotes vascular spasm and abnormal effort. Each results in abnormal depression of pulse-pressure, the maintenance of which to a certain magnitude is necessary to proper nutrition of the brain and other tissues.

3. The blood stasis manifested by fall of systolic pressure may be measurably counteracted by the support of an abdominal belt. The diastolic blood-pressure represents the head of power available for the coronary circulation. When that pressure is high and the heartbeat vigorous we have the conditions of cardiac hypertrophy. When it is high and the heartbeat is feeble the result is probably simple dilatation. Fainting and sudden death are probably the results of critical lowering of diastolic blood-pressure. Abnormal elevation of diastolic pressure is the usual cause of depression of pulse-pressure in the erect posture. It probably signifies lack of contractile vigor in the ventricles. Small doses of digitalis may cause clinical improvement in such cases.

4. The manifestation of chronic circulation deficiency is probably usually founded upon toxemia from focal infection or upon a larval form of tuberculosis, here denominated "occult tuberculosis."

5. It is suggested that estimations should be made under different conditions of the velocity of the blood-current, as represented by the product obtained in multiplying the pulse-pressure by the pulse-rate.

6. Attention is called to the great frequency with which, in persons suffering from weakness of the circulation, the pulse sounds revealed by the auscultatory method are enfeebled or absent. This failure has some relation to venous congestion below the cuff.

7. The maximal arterial blood-pressure is more or less markedly affected by respiratory movement. According to these observations it is highest during expiration and lowest during inspiration. The difference between the maxima taken in the two phases of respiration may reach, with quiet breathing, anywhere between 0 and 20 mm.

Hg. Perhaps the average difference between the "maximum systolic" and the "minimum systolic" blood-pressure is 5 mm. Hg.

8. Besides the influence of respiratory movement the systolic blood-pressure is subject to another secondary cause of fluctuation. This probably consists in more or less slow variations in the intensity of vasomotor tone. The height of maximal pressure may apparently change 30 mm. Hg. within a minute from this cause. The occurrence and range of such pressure variations seem to be determined by the vital reaction of the subject to strain, and are presumably of value to clinical diagnosis.

NOTE ON THE VITAL CAPACITY OF THE LUNGS AND THE CARBON DIOXIDE COMBINING CAPACITY OF THE BLOOD IN CASES OF "EFFORT SYNDROME."

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I. The Vital Capacity of the Lungs. The majority of the patients at U. S. Army General Hospital No. 9 having the symptom-complex known as the "irritable heart of soldiers," or "effort syndrome," complained of shortness of breath following varying amounts of exercise. Since it has been shown that in cases of organic heart disease the tendency to dyspnea on exertion corresponds closely to the degree of the decrease of the vital capacity of the lungs below the normal, a group of 100 soldiers with "irritable heart" were studied to determine whether an interference with pulmonary ventilation depending on such a cause might be a factor in producing their dyspnea.

The vital capacity was determined in each instance by having the patient exhale into a small spirometer from the point of maximum forced inspiration to that of maximum forced expiration. In each instance the individual was allowed three or more trials until the observer was satisfied that the maximum point had been reached and the highest reading was considered as the subject's vital capacity. A few individuals, whose lack of effort or coöperation made it clear that the results in their cases did not represent their true vital capacity, are not included in the series. The readings were compared with the normal figures for individuals of approxi-

mately the same height and the results expressed in percentage of the appropriate normal.

The normal standards used were those given by Peabody and Wentworth.[1] They are based on the relationship between vital capacity of the lungs and height, as is shown in the following table:

	Height (cm.).	Vital capacity (c.c.).
Group I	182.5 and above	5100
Group II	173.5–182.5	4800
Group III	below 173.5	4000

In a study of 96 normal males, Peabody and Wentworth found that all but one had a vital capacity of at least 90 per cent. of these standards. Patients with heart disease who developed dyspnea on moderately severe exertion were usually found to have a vital capacity between 50 and 90 per cent. of the normal, and the vital capacity was lowest in those with the most marked tendency to dyspnea. The results of the present investigation of soldiers with "irritable heart" is shown in the following table:

Vital capacity. Per cent. of normal.	Number.
110 or over	9
105 to 109	9
100 to 104	17
95 to 99	18
90 to 94	27
85 to 89	13
80 to 84	7

It will be seen that 80 per cent. of these cases had a vital capacity of 90 per cent. of the normal or more and that 93 per cent. had a vital capacity of at least 85 per cent. of the normal standard. Thus a small proportion of the patients with "irritable heart" have a vital capacity which falls below what have been accepted as the normal standards, but neither the number of cases nor the degree of decrease of vital capacity are sufficient to indicate that the tendency to dyspnea in these patients is in any way dependent on a diminished vital capacity of the lungs. Tests of general muscular strength showed no relation between the muscular development and the vital capacity of the lungs.

II. The Carbon Dioxide Combining Capacity of the Blood Plasma. Dyspnea in patients with "irritable heart" has been attributed by Lewis and his co-workers[2] to a deficiency of buffer salts in the blood. According to them the production of acids as a result of exercise causes change in the reaction of the blood, with consequent stimulation of the respiratory center.

[1] Arch. Int. Med., 1917, xx, 449.

[2] Lewis, Cotton, Bancroft, Milroy, Dufton and Parsons: British Med. Jour., 1916, ii, 517.

"Shortness of breath" on exertion was an almost constant complaint of the patients with "irritable heart" as observed at this hospital, but the type of patients differed somewhat from those studied by Lewis, inasmuch as in most cases seen here the symptoms had been present for a considerable length of time in civilian life and the condition was only intensified by their entrance into the army. However, a few cases were studied whose symptoms were of recent development following the physical and mental strain of military service. The dyspnea in all of these cases was most marked on exertion and rarely seen at rest, except under conditions of nervous strain.

In order to determine whether a diminished alkalinity of the blood played a role in the production of dyspnea in patients with "irritable heart," as seen at this hospital, a study was made of the carbon dioxide combining capacity of the blood according to the method of Van Slyke.[3] By this method the carbon dioxide bound as bicarbonate in the blood plasma is determined and the results given in volume percentage. The normal varies from 53 to 77 volume per cent., while figures below 50 per cent. in adults indicate an acidosis, and symptoms of acid intoxication usually appear with a fall below 30 per cent. All observations were made on patients at rest and at least eight hours after the last meal.

Observations were made on fifty-four cases, and the carbon dioxide chemically bound as bicarbonate was found to fall within normal limits in all instances. Since, therefore, the carbon dioxide combining capacity of the blood is normal there is no indication that a decrease in the buffer salts of the blood is a factor in the production of dyspnea in patients with "irritable heart," as seen at this hospital.

NOTE.—These studies were carried out under the direction of Major Francis W. Peabody, M.C., and Capt. Bertnard Smith, M.C.

STUDIES OF CASES OF "EFFORT SYNDROME" WITH MEASURED WORK.

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As a method of testing the functional efficiency of the heart muscle, Barringer[1] has suggested the study of the blood-pressure

[3] Jour. Biol. Chem., 1917, xxx, 347.
[1] Arch. Int. Med., 1916, xvii, 363; Ibid., 1917, xx, 829.

changes after periods of severe exercise. A moderate amount of work is typically followed by a rise of blood-pressure of short duration and then by a fall to the normal again. When, however, the work is sufficient to overtax the heart, it is said that the immediate rise of blood-pressure is followed by a further "delayed" rise at a period of fifty to ninety seconds after the cessation of work. The observations reported here were undertaken primarily to find out whether any such response, which might indicate a myocardial weakness, would be found in soldiers who gave the clinical picture of the so-called "effort syndrome," and the method used is based on that devised by Barringer.

Pulse counts and systolic blood-pressure determinations were made before and after each exercise period, with the subject in the erect posture. Work was furnished by full extension from the shoulder of two five-pound dumb-bells. Extension and return occupied one second each and the rhythm was maintained by a metronome. The subjects were instructed and encouraged to exercise with the dumb-bells until they were completely fatigued, and three periods of work were performed with rest periods of five minutes interpolated between them. At the cessation of the work periods the blood-pressure was read by the auscultation method with a Riva-Rocci type of sphygmomanometer. The systolic blood-pressure was first taken ten seconds after the work stopped, then twenty seconds later and afterward at intervals of thirty seconds for a total period of three minutes following cessation of work. The pulse-rate was counted by another observer for fifteen seconds, beginning ten seconds after the exercise stopped, and thereafter for fifteen seconds at half-minute intervals over a period of three minutes.

Observations of the systolic blood-pressure and the pulse-rate after each of three successive periods of work were made on 50 patients with "effort syndrome" and on 11 healthy enlisted men of the medical detachment. Most of the patients had symptoms of long standing, antedating their military service by many years. The total amount of work done in the three periods by the normal soldiers varied between 6000 and 12,000 foot-pounds, five of them doing over 10,000 foot-pounds. The majority of the patients were only able to perform considerably smaller amounts of work, and for convenience they may be divided into groups depending on the total amount of work done. Thus 5 patients did only between 2000 and 3000 foot-pounds; 10 patients did between 3000 and 4000 foot-pounds; 17 did between 4000 and 5000 foot-pounds; 10 did between 5000 and 6000 foot-pounds; 8 between 6000 and 11,000 foot-pounds. Of the latter group only one subject performed over 10,000 foot-pounds of work.

In Table I there is presented an analysis of the average pulse reactions for each group of subjects. Under the heading "Rest" the pulse-rate before exercise is given, and in the three following

columns in each period appear the pulse-rate 10 seconds, 120 seconds and 180 seconds after stopping exercise. It should be remembered that in each period the subject was urged to do the maximum amount of work of which he was capable, and the interval between the periods of work was five minutes. It will be noted that the pulse-rate at rest was always higher for the patients than for the normals, and that in each succeeding rest period the pulse-rate of the patients tends to increase slightly more than it does in the normals. On the other hand the immediate increase in pulse-rate after exercise, as shown by the count taken ten seconds after stopping, is by no means constantly greater in the patients than in the normals. At the end of three minutes the pulse-rate of the patients had returned to its value at rest nearly as completely as had that of the normal subjects. The same is true of the pulse-rate taken two minutes after exercise stopped. There is thus no definite evidence that the pulse returns to its basal level more slowly in this group of patients with "effort syndrome" than it does in normal persons after exercise.

TABLE I.—PULSE-RATES BEFORE AND AFTER EXERCISE (AVERAGES FOR EACH GROUP).

Group.	No. of cases.	Work, foot-pounds.	Pulse-rates.											
			Period I.				Period II.				Period III.			
			Rest.	10 seconds after work.	120 seconds after work.	180 seconds after work.	Rest.	10 seconds after work.	120 seconds after work.	180 seconds after work.	Rest.	10 seconds after work.	120 seconds after work.	180 seconds after work.
Normals	11	6–12000	79	111	85	83	84	115	87	80	80	125	92	86
I . .	8	6–11000	94	136	119	111	110	130	119	114	112	132	119	116
II . .	10	5–6000	84	107	96	95	94	114	105	100	100	116	104	100
III . .	17	4–5000	98	123	109	104	103	125	112	108	107	128	114	109
IV . .	10	3–4000	97	122	108	105	105	122	111	107	107	122	108	105
V . .	5	2–3000	87	110	97	98	96	111	99	97	97	111	98	96

Table II presents a similar analysis of the changes in systolic blood-pressure after exercise. The blood-pressure at rest before the first exercise period is somewhat higher in the three groups of patients doing the largest amounts of work than it is in the normals. The rise in blood-pressure immediately after exercise is distinctly less in the patients than in the normals, and it seems probable that this depends on the fact that they did less work. The return of the blood-pressure to the figures at which it was before exercise is as complete and as rapid among the patients as among the normals. There is a general tendency in the patients for the blood-pressure to assume a lower level at rest after each succeeding exercise period, and this is not noticeable in the normal subjects.

TABLE II.—SYSTOLIC BLOOD-PRESSURE BEFORE AND AFTER EXERCISE (AVERAGES FOR EACH GROUP).

Group.	No. of cases.	Work, foot-pounds.	Systolic blood-pressure (mm. mercury).											
			Period I.				Period II.				Period III.			
			Rest.	10 seconds after work.	120 seconds after work.	180 seconds after work.	Rest.	10 seconds after work.	120 seconds after work.	180 seconds after work.	Rest.	10 seconds after work.	120 seconds after work.	180 seconds after work.
Normals	11	6–12000	121	133	121	120	121	127	120	119	120	130	121	119
I . .	8	6–11000	135	138	134	131	128	135	128	126	124	130	122	121
II . .	10	5–6000	127	130	126	125	124	128	123	122	121	126	121	120
III . .	17	4–5000	130	136	131	128	128	132	127	126	124	128	123	122
IV . .	10	3–4000	123	128	124	123	122	129	121	118	118	126	120	118
V . .	5	2–3000	116	123	121	120	120	122	115	116	115	118	113	112

In a number of the patients slight "delayed rises" in blood-pressure were observed from thirty to ninety seconds after stopping the exercise. These were almost invariably very small (from 2 to 6 mm.) and occurred after only one or two of the periods of exercise. Sometimes they appeared after the first period and not after the second or third, or after the first and second periods and not after the third. On the whole, they were less frequent after the third period. There were no "delayed rises" in the blood-pressure of significant degree which appeared with any constancy or which tended to increase with additional amounts of work. The only instance in which a "delayed rise" occurred after all three periods, and was of sufficient degree to have a possible significance was in a normal subject in whom rises of 8, 17 and 8 mm. were observed after each of the three exercise periods. Thus in spite of making the subjects do the maximum amount of work of which they were capable, "delayed rise" of blood-pressure was only rarely and inconstantly observed, and it was almost always of so slight a degree as not to have any clinical significance. As far as this phenomenon goes there is no evidence indicating a myocardial insufficiency in the patients with "effort syndromes" who were studied.

The most striking feature of this investigation was that only a small percentage of the patients were able to do anything like the amount of work which the normal subjects could do. Two elements seemed to be at the bottom of this. In the first place the patients appeared to lack the energy and "drive" to force themselves to continue after they became tired, and in the second place they showed a definite weakness of the skeletal muscles. That this latter is important is shown by Table III, in which the amount of work done in these exercise tests is compared for each group with the average strength-weight ratio as determined by the

"spring balance" method of Dr. E. G. Martin. The figure given for the normal strength-weight ratio is that found by Capt. Bertnard Smith from tests made on a large series of normal soldiers,[2] and all the other strength tests were also made by him. Capt. Smith's observations show that poor muscular development is a prominent feature in many cases of "effort syndrome" with long-standing symptoms. It is much less evident in the cases whose symptoms have lasted only a short time, and where they are directly dependent on the physical and nervous strain of the military experience.

TABLE III.

Group.	Work, foot-pounds.	Strength, weight ratio.
Normals	6–12000	25.6
I	6–11000	24.4
II	5–6000	20.5
III	4–5000	15.7
IV	3–4000	11.0
V	2–3000	11.0

It will be seen that there is a very close correspondence between the average strength of the skeletal muscular system and the amount of work done in the exercise periods. When the strength tests of the various individuals are studied it is found that certain exceptions to this arise. This is most definitely seen in Group V, in which three of the subjects had strength-weight ratios of 6.7, 7.5 and 7.9, while in two others they were 14.1 and 18.9. These men were both better developed than the others in the group, but they were extremely neurotic and completely lacking in energy. It was quite impossible to make them undertake any continuous exertion, as they immediately began to complain of fatigue, one of the cardinal symptoms of the "effort syndrome." The fact that their strength tests were better than those of the others in the group is accounted for by the fact that the determination of the strength test depends on a series of single pulls against the spring balance and does not require continued exertion. This lack of energy and "push," which may amount to what may be termed "asthenia," is a part of the neurotic constitution which underlies most cases of "effort syndrome." In some instances it seems to be due to a fear of bringing on uncomfortable symptoms, and in some, particularly in those who believe they have a "weak heart," to a fear of injuring themselves seriously; but in others it seems to be due to the inherent lack of force of character which manifests itself in so many of their other reactions toward life. It is often the underlying factor which has led to their poor physical development, for they have never put themselves through a hard course of physical training. The "fatigue" of which these patients complain so frequently, and of which their poor per-

[2] The Possibilities of Physical Development in Cases of Effort Syndrome by Means of Graded Exercises. (To be published.)

formance of work, as illustrated in the observations just described, is a manifestation, is a complex symptom. In how far it is dependent in a given case, on a neuropathic state and in how far on weakness of skeletal musculature, it is often impossible to determine. It seems clear, however, that in cases of "effort syndrome" in which the symptoms have been present for many years, as they had been in most of the patients at Lakewood, both factors are to be considered. It is probable that a vicious circle is easily established and that each factor reacts detrimentally on the other.

CONCLUSIONS. A study was undertaken of the changes in pulse-rate and blood-pressure taking place in fifty patients with "effort syndrome" after the hardest exercise which they could be induced to perform. These were for the most part patients with symptoms of many years' duration. The amount of work which they could do before becoming fatigued was much less than was done by normal controls. The pulse-rate at rest was higher than in the normals, but the rise after exercise and the time for return of the pulse-rate to its resting value were not definitely abnormal. No "delayed rise" of blood-pressure suggesting myocardial inefficiency was observed. The amount of work which the subjects were able to perform usually corresponded closely to their physical strength as determined by tests of the skeletal muscles, and this indicates that lack of development of the skeletal muscular system is a factor to be considered in the cause of the fatigue following slight exertion in certain types of cases of "effort syndrome."

THE POSITION OF THE ARM IN BLOOD-PRESSURE MEASUREMENTS.

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BLOOD-PRESSURE readings should be obtained with the patient's arm at the side of his chest, as the normal reading varies considerably with the arm in different positions. This holds for the seated, the standing and the recumbent postures.

Changing the position of the arm, as in elevating the elbow, produces changes in the blood-pressure of the arm probably as the result of both vasomotor and hydrostatic effects upon the column of blood. Leonard Hill has shown there exists a difference between the pressures in two arteries placed at different levels in relation to the heart. Thus the two arms in different positions and the arm and leg readings would differ by the hydrostatic pressure of the column of blood which separates the points of measurement.

The following studies were made upon men between the ages of twenty and thirty years, with a view to determine the effect upon the blood-pressure readings of raising the arm to various angles from the side of the body. The following groups of cases were examined:

Normal heart	27 cases
Neurocirculatory asthenia	13 "
Thyrotoxic and exophthalmic goitre	7 "
Simple tachycardia	5 "
Paroxysmal tachycardia	5 "
Nephritic hypertension	5 "
Mitral regurgitation	2 "
Aortic regurgitation	3 "

METHOD. The patient was comfortably seated, the arm at his side and the elbow and forearm supported. The systolic and diastolic pressures were taken by the Korotkow method, using a wide cuff. The highest level of armlet pressure at which sound was audible was read as the systolic pressure. The level of armlet pressure at which all sound suddenly declined was taken as the index of diastolic pressure. The arm was then raised to an angle of 45 degrees from the side of the chest and the readings again recorded. This was repeated for 90, 135 and 180 degrees respectively, while the patient's elbow was supported by an assistant.

Table I presents the form in which our data were collected, with a list of characteristic readings from the normal cases.

TABLE I.

	Syst.	Dias.	S.	D.	S.	D.	S.	D.	S.	D.	S.	D.
Blood-pressure, seated	118	80	109	65	112	68	110	68	120	70	100	75
Arm elevated 45 degrees	108	68	112	50	106	65	102	58	105	70	104	75
" " 90 "	104	64	110	54	110	56	96	50	98	55	100	70
" " 135 "	92	60	102	30	76	52	76	40	86	50	80	60
" " 180 "	90	50	82	0	66	45	35	0	68	48	80	48
	Case I.		Case II.		Case III.				Case IV.			

BLOOD-PRESSURE READINGS IN THE NORMAL CASES. The effect of the position of the arm on blood-pressure readings was studied in 27 cases of normal heart; in all 47 series of tests were made. The differences were fairly constant for the individual. Fig. 1 shows graphically and very clearly the average of the entire series of figures from this group. The systolic pressure fell an average of 8 mm. of mercury in the first 45 degrees of elevation, 6 mm. more to 90 degrees, 14 mm. more to 135 degrees and 25 mm. on raising the arm vertically; a total fall of 53 mm. in the systolic pressure in 180 degrees of elevation. The diastolic pressure shows a parallel curve, slightly less than the systolic, with a total fall of 42 mm. On lowering the elbow to the previous position the pressure promptly

returns to its former reading. Table II presents a list of characteristic figures as they were calculated from the normal group of cases.

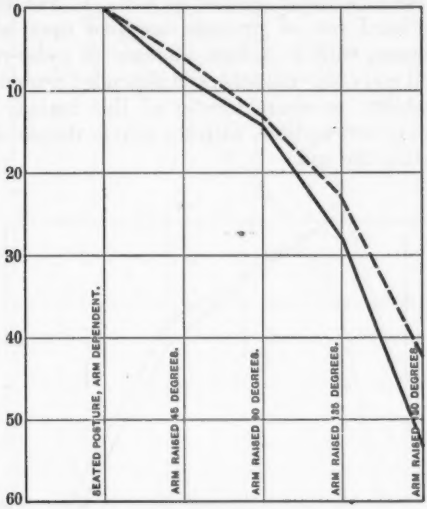

FIG. 1.—Effect of the position of the arm on blood-pressure measurements: Average in twenty-seven cases with normal cardiovascular conditions.

TABLE II.

Elevation of 45 degrees.		From 45 to 90 degrees.		From 90 to 135 degrees.		From 135 to 180 degrees.	
Syst.	Diast.	Syst.	Diast.	Syst.	Diast.	Syst.	Diast.
− 2	−16	+ 2	−20	−26	−40	−14	− 0
−16	− 2	− 2	−12	−14	−20	−14	−40
− 2	− 0	− 6	− 8	−24	− 6	− 9	−15
− 8	− 4	− 2	− 4	− 6	−10	−24	− 6
−10	− 0	−20	−30	− 5	− 5	− 0	− 2
−15	− 0	− 7	−15	−12	− 5	−18	−12
+ 4	− 0	− 4	− 5	−20	−10	− 0	−86
− 1	−10	− 0	− 6	−18	−20	−21	−56
− 8	−14	− 0	−10	−16	− 4	− 8	−10
−10	− 8	−14	−14	− 4	−10	−10	−11
− 6	− 3	− 6	−13	−24	− 7	−10	−40
− 8	−10	− 6	− 8	−20	−10	−36	−12

POSITION OF THE ARM AND BLOOD-PRESSURE READINGS IN NEUROCIRCULATORY ASTHENIA. Thirteen cases of neurocirculatory asthenia were studied in which 21 series of arm tests were made. The curve in this condition is distinctly exaggerated over the normal (Fig. 2). The change of pressure, both systolic and diastolic, is more precipitate, 15 mm. up to 90 degrees elevation and 52 mm. more up to 180 degrees, a total fall of 67 mm. systolic pressure in 180 degrees elevation of the arm and of 50 mm. diastolic pressure.

This is significant and is probably the result of the vasomotor instability in these cases. It is therefore to be observed that it is not alone the hydrostatic pressure that factors in this difference, but the state of the vasomotor support as well. It was in these cases that an occasional rise of pressure occurred upon elevating the arm, synchronous with a sudden increase of pulse-rate. These were not usual and only transient, and depended probably upon the nervous instability so characteristic of this malady. In a few cases the sounds were audible, with the arm in the elevated position without inflating the cuff.

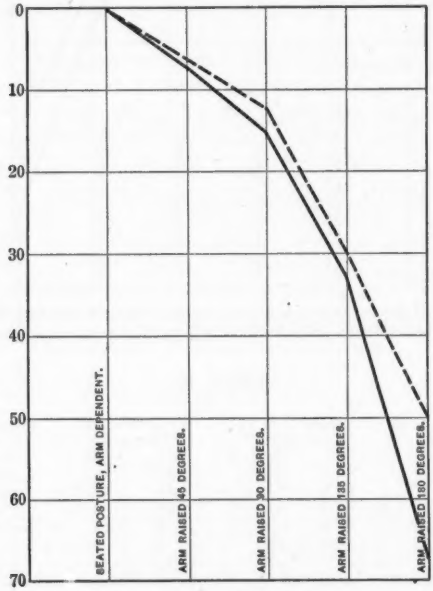

FIG. 2.—Effect of the position of the arm on blood-pressure measurements: Average in thirteen cases of neurocirculatory asthenia.

IN THYROTOXIC CASES AND EXOPHTHALMIC GOITRE. Still more striking changes of blood-pressure readings were obtained in the cases of exophthalmic goitre and thyrotoxic heart. Ten series of tests were made in the 7 cases observed. The diminution of systolic pressure on raising the arm was as follows: 12 mm. in 45 degrees, 9 mm. more to 90 degrees, 13 mm. more to 135 degrees and finally 50 mm. in the last angle. That is, a total of 84 mm. of mercury systolic pressure was lost by elevating the arm to 180 degrees (Fig. 3). In these cases the systolic sound was often audible at 0 pressure, with the arm in the elevated position.

In the groups thus far observed the amount of fall of pressure progressively increased with the elevation of the arm.

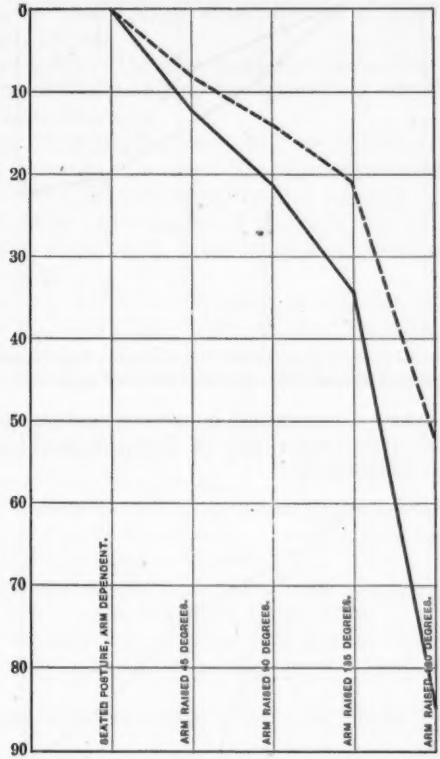

FIG. 3.—Effect of the position of the arm on blood-pressure measurements: Average in seven cases of hyperthyroidism and exophthalmic goitre.

IN CASES OF NEPHRITIC HYPERTENSION. In 5 cases of nephritic hypertension the characteristic feature was the blood-pressure maintained high despite elevation of the arm. In the previous groups we note that the fall of pressures increases as the arm is raised. In the group of hypertension cases, on the contrary, whatever fall takes place occurs at first; thus 9 mm. up to 45 degrees elevation, 6 mm. more up to 90 degrees, 6 more to 135 degrees and only 2 mm. finally; a total fall of only 23 mm. of mercury (Fig. 4).

That arterial hypertonus is an important factor in the high blood-pressure readings obtained in nephritis was repeatedly emphasized by Russell. Janeway and Park also found that the contraction of the arterial muscle is a definite factor in influencing its compressi-

bility, and therefore a positive factor in blood-pressure readings. Our findings in the cases of hypertension indicate that the hyper-

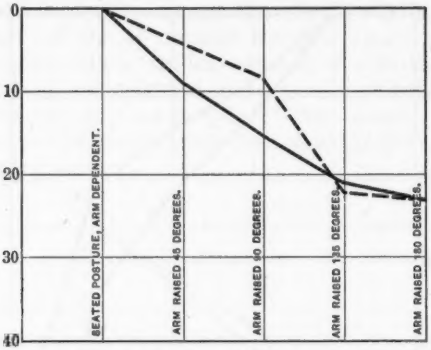

FIG. 4.—Effect of the position of the arm on blood-pressure measurements: Average in five cases of parenchymatous nephritis with hypertension.

tonus of the artery is maintained in varying positions of the arm, and is therefore an important cause of the maintained high pressure when the arm is elevated.

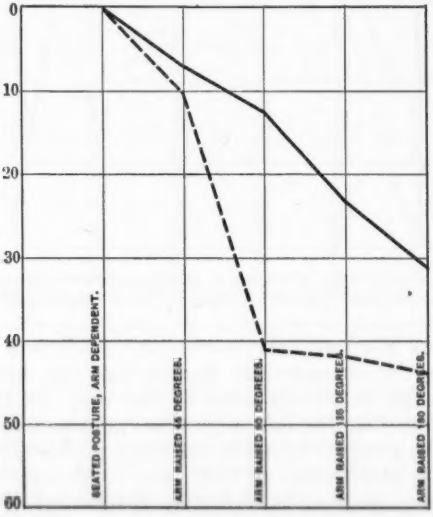

FIG. 5.—Effect of the position of the arm on blood-pressure measurements: Average in three cases of aortic regurgitation.

SIMPLE AND PAROXYSMAL TACHYCARDIA. In the 5 cases of simple tachycardia and the 5 cases of paroxysmal tachycardia a total of

fifteen tests were made. The difference of behavior of these cases from the normal is not marked. Elevation of the arm caused less of a fall of pressure in these cases than in the normal. We may assume this as natural, these cases showing slightly lower blood-pressure than normal.

IN ENDOCARDITIS. The same holds for two cases of compensated mitral regurgitation, in which four tests were made. The curve approximates the normal.

But aortic regurgitation seems to give a characteristic fall of pressure on elevating the arm. The diastolic pressure falls more than the systolic and more promptly than normally, accomplishing its main reduction up 90 degrees of elevation (Fig. 5). It is in this condition that there exists a marked difference between the arm and leg readings.

CONCLUSIONS. 1. Tests were made to note the effect of raising the arm upon auscultatory blood-pressure readings. Groups of cases were studied, including the normal, neurocirculatory asthenia, thyrotoxic conditions, tachycardia, nephritic hypertension and endocarditis.

2. The normal effect is a progressive fall of the systolic and diastolic pressure readings as the arm is raised upward; the amount of fall increases with the elevation.

3. The fall of pressures is more marked than normal in cases of neurocirculatory asthenia and is most precipitate in cases of hyperthyroidism and exophthalmic goitre.

4. The pressure yielding very little to elevation of the arm is a characteristic feature in nephritic hypertension.

5. In aortic regurgitation the diastolic pressure falls more steeply than the systolic, and its main reduction occurs up to 90 degrees elevation.

6. The graphic curves suggest a diagnostic import to the findings.

REFERENCES.

1. Hill, L.: Heart, 1909, i, 73.
2. Hill, L., and Rowlands, R. A.: Heart, 1912, iii, 219.
3. MacWilliam, J. A., and Kesson, J. E.: Heart, 1913, iv, 279.
4. Janeway and Park: Arch. Int. Med., 1910, vi, 586.
5. Russell: Arterial Hypertonus, Sclerosis, and Blood-pressure, 1908, 87.
6. Kahn, M. H.: AM. JOUR. MED. SC., 1919, clvii, 634.

FUNCTIONAL DIAGNOSIS OF POLYGLANDULAR DISEASE IN ACROMEGALY AND OTHER DISTURBANCES OF THE HYPOPHYSIS.

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The unusual opportunity afforded by the admission of 5 cases of hypophyseal disease to our medical clinic in the course of a few weeks was the stimulus for the work. Whereas in the previous 6000 medical admissions there were 11 cases (0.18 per cent.) we were suddenly confronted with these 5 cases. One case studied in 1914 has been added to the 5 recent cases.

As neither time nor space will permit a detailed history of these 6 cases we will content ourselves with a short summary of each case.

Case I.—J. J., aged thirty-one years; farmer; not referred. Admitted December 23, 1914. Clinical No. 1814.

Summary. Acromegaly: round-cell sarcoma of pituitary gland. Symptoms first of hyperpituitarism, followed later by hypopituitarism; characteristic changes in acra; somnolence; polyphagia; optic atrophy and divergent strabismus; sugar tolerance increased; sella turcica enormously enlarged; trans-sphenoidal operation attempted December 28, 1914, but interrupted because of patient's condition; death three months later, with symptoms of right-sided hemiplegia; autopsy revealed an enormous pituitary tumor, with marked cerebral compression; atrophy of islands of Langherhans; atrophy of testes; slight cystic degeneration of the thyroid gland.

The adrenalin conjunctival test was strongly positive for adrenal insufficiency, while both subcutaneous tests spoke for normal function. The pituitrin conjunctival and both subcutaneous tests suggested a hypopituitarism.

Case II.—Mrs. A. W., aged fifty-two years, female; referred by Dr. Cretzmeyer, Algona, Iowa. Admitted January 10, 1919. Clinical No. 5808.

Summary. Acromegaly; hyperpituitarism; amenorrhea at thirty-nine years; severe frontal headaches since forty-eighth year, followed by failure of vision, enlargement of head, hands and feet, profuse night-sweats; typical facies; acra characteristic; hypertrophy of genitalia; fundi negative; sella turcica enlarged; slight glycosuria, with much decrease in sugar tolerance; normal renal function. Adrenalin conjunctival and subcutaneous tests indicate hypofunction of adrenals; pituitrin tests doubtful; posterior lobe caused subjective improvement.

Case III.—Mrs. O. H., aged forty-seven years; not referred; Clinton, Iowa. Admitted March 8, 1919. Clinical No. 6009.

Summary. Acromegaly; hyperpituitarism; symptoms for eight years; typical facies; slight goitre; acra much enlarged; divergent strabismus; greatly enlarged sella turcica; glycosuria; hyperglycemia; adrenalin conjunctival test spoke for ε normal and the subcutaneous tests for a hypofunction of adrenals. The pituitrin conjunctival test was markedly positive, while of the subcutaneous tests, the blood-pressure one was normal and the blood picture within possible normal limits.

CASE IV.—James W. R., aged twenty-nine years; linotype operator; referred by Dr. Fred Bailey, Cedar Rapids, Iowa. Admitted February 27, 1919. Clinical No. 5974.

Summary. Sarcoma of the occipitoparietal lobe; no localizing symptoms; diagnosis of hyperpituitarism from tumor of hypophysis made because of occipital and temporal headache, double papilledema, distorted sella turcica and decreased sugar tolerance; transphenoidal decompression, followed in two weeks by death; autopsy revealed flattening of hypophysis from greatly increased intracranial pressure, which had thinned out even the sella; microscopically, hyperemia of the entire hypophysis, with hemorrhage by diapedesis into pars nervosa. Adrenalin conjunctival test and one of the subcutaneous tests spoke for hypofunction of adrenals. All three pituitrin tests were normal.

CASE V.—Miss L. K., aged sixteen years; not referred. Admitted March 15, 1919. Clinical No. 6036.

Summary. Dystrophia adiposogenitalis; Froehlich syndrome; malaria and typhoid fevers in childhood; periodical diplopia, with headache, nausea and vomiting; amenorrhea at fourteenth year, followed by enlargement of breasts and rapid gain in weight of forty-two pounds; nycturia; facies and figure of hypopituitarism; convergent strabismus; transient glycosuria and marked decrease of sugar tolerance; sella turcica small; adrenalin conjunctival and subcutaneous tests spoke for normal adrenal function. The pituitrin conjunctival and subcutaneous tests were also within normal limits.

CASE VI.—Mrs. M. L., aged thirty-four years; referred by Dr. W. W. Daut, Muscatine, Iowa. Admitted May 5, 1919. Clinical No. 6225.

Summary. Dystrophia adiposogenitalis; Froehlich syndrome; obesity; glycosuria; marked family history of obesity on maternal side and in sisters; amenorrhea; obesity; headaches; nycturia; glycosuria; signs of tertiary lues and old pelvic cellulitis; Wassermann negative; normal facies; normal hair except for hirsuties over face; slender extremities; sella turcica not enlarged; adrenalin conjunctival and subcutaneous blood-picture tests spoke for normal function of adrenals. The diminution of 14 mm. in systolic pressure cannot be explained. The conjunctival and subcutaneous pituitrin tests were normal.

A paper by Karl Csépai[1] which appeared in 1914 described a comparatively new method of investigation of the diseases of the endocrine glands, and has been applied to our six cases, which form the material of this paper.

It seems hardly necessary to state that the determination of the sugar tolerance is as yet the most accurate and only scientific method for an estimation of the activity of the internal secretion of the hypophysis, thyroid gland and pancreas. It is not so long since that we first appreciated the frequency in hyperthyroidism of an alimentary glocosuria or even of a frank glycosuria, whereas in hypothyroidism a normal or increased sugar tolerance was observed. An excellent paper by H. R. Geyelin,[2] in 1915, states that alimentary hyperglycemia and alimentary glycosuria are not uncommon in even the very mild cases of hyperthyroidism, and that in the moderate or severe cases a fasting or postprandial hyperglycemia was present in 90 per cent. of his series.

Our knowledge of the relationship of the internal secretion of the pancreas to glycosuria and hyperglycemia dates back to the work of von Mering and Minkowski (1890) and E. L. Opie (1903), and has since then received absolute confirmation.

The role of the hypophysis in carbohydrate metabolism was much more recently appreciated, although it had long been known that glycosuria was a frequent associated phenomenon of acromegaly. Thanks to von Noorden (1910) and Cushing (1912) the importance of the determination of the sugar tolerance for the diagnosis of a suspected disturbance of the hypophysis is now universally accepted. Further, as the result of the correlation of much experimental work and many clinical observations, it seems definitely established that the pars intermedia is directly concerned in carbohydrate metabolism and that hypertrophy of it causes polyuria, diminished carbohydrate tolerance or even a frank glycosuria, while hypoplasia or degeneration of the pars intermedia will result in a high degree of sugar tolerance.

In the early stages of acromegaly, therefore, it is common to find a decreased suger tolerance as did we in two cases of acromegaly, one of secondary hyperpituitarism and in the two cases of dystrophia adiposogenitalis. (See Table I). On the other hand, in the latter stages of the hypophyseal disease, when the pars intermedia has been destroyed by pressure or by invasion, as occurred in our case of acromegaly from sarcoma of the pituitary gland, increased sugar tolerance is to be expected.

The method of sugar tolerance determination is too well known to require a detailed description. We accepted as the usual minimum normal limit 100 grams of glucose, which was administered to the

[1] Deutsch. Arch. f. klin. Med., 1914, cxvi, 461.
[2] Arch. Int. Med., 1915, xvi, 975.

TABLE I.

Case.	Diagnosis.	3 gtt. conjunctivally.		0.5 c.c. subcutaneously.		Carbohydrate tolerance.
		Adrenalin.	Pituitrin.	Adrenalin.	Pituitrin.	
	Csépai's normal	+10–20 min.	+ 0–10 min.	+30–60 m.m. sys.		
	Author's 15 controls . .	+10–30 min.	+ 0–25 min.	+ 3–42 m.m. sys.	+ 5–38 m.m. sys.	
1	Csépai's acromegaly . .	+15 min. −	+25 min. +	+60 m.m. sys. −	.....	Diminished.
2	Csépai's acromegaly . .	+10 min. −	+15 min. +	+70 m.m. sys. +	.....	Diminished.
3	Csépai's acromegaly . .	+35 min. +	+ 8 min. −	0 m.m. sys. −	.....	Normal or increased.
2	Csépai's dystro. adip. gen. .	+35 min. +	0 min. −	0 m.m. sys. −	.....	Increased.
1	Author's acromegaly . .	+45 min. +	+15 min. +	+10 m.m. sys. −	0 " " −	Increased to 300.
2	Author's acromegaly . .	+25 min. +	+15 min. +	+13 m.m. sys. −	+ 8 m.m. sys. −	Diminished.
3	Author's acromegaly . .	+15 min. −	+45 min. +	+ 2 m.m. sys. −	+12 m.m. sys. −	" with glycosuria.
	Author's hyperpituitarism	+35 min. +	0 min. −	+14 m.m. sys. −	+10 m.m. sys. −	Diminished.
1	Author's dystro. adip. gen. .	+15 min. −	0 min. −	+28 m.m. sys. −	+13 m.m. sys. −	Diminished.
2	Author's dystro. adip. gen. .	+ 5 min. −	+ 5 min. −	−14 m.m. sys. +	+10 m.m. sys. −	" with glycosuria.

fasting patient after an immediately preliminary examination of the urine and blood sugar; at hourly intervals blood and urine examinations were made for a period of four hours. Glycosuria and hyperglycemia, of course, indicate a decreased sugar tolerance; some even regard a slow return of the blood-sugar content to its previous normal as also pathognomonic. If neither glycosuria nor hyperglycemia occurs one administers on successive days, 200, 300 or even 400 grams of glucose. There is still some doubt as to the exact upper normal limit of the sugar tolerance, though it was formerly considered to be 250 grams. It might therefore be safer to say that in our first case of acromegaly the sugar tolerance was normal or increased.

It is well to bear in mind that in spite of the unusually protected site that the hypophysis enjoys, it is nevertheless susceptible to a disturbance of its function by greatly increased intracranial pressure from any cause, as internal hydrocephalus, tumor of the brain or of the adjacent tissues. Case V of our series was first considered to be a tumor of the silent area of the brain, but eventually the discovery of a flattened sella turcica and a decreased sugar tolerance seemed to justify a localization of the tumor in the region of the pituitary gland; accordingly a transsphenoidal decompression was undertaken. Though the postmortem three weeks later revealed a large sarcoma of the white matter of the occipitoparietal lobe, it was also found that the tremendous increase of intracranial pressure had not only thinned out the vertex of the skull to almost egg-shell transparency but had also completely flattened out the sella turcica and its contents, and so produced a general hyperemia of the hypophysis, with hemorrhage into the pars nervosa. We were therefore justified in a diagnosis of secondary hyperpituitarism.

The two methods suggested by Csépai were the conjunctival instillation of adrenalin or pituitrin and the subcutaneous injection of both.

The Conjunctival Adrenalin Test. In several hundred controls Csépai found that normally 3 drops of a 1 to 1000 solution of adrenalin will cause in a few minutes a slight or moderate blanching of the conjunctival sac, which will persist for ten to twenty minutes. The procedure is very simple and is, as a rule, easily and rapidly performed. The patient should be asked to keep both eyes closed for five minutes before the test. Further, only one conjunctiva is instilled, the other one being used for comparison.

My assistants used as normal controls fifteen medical patients, who showed no evidence of polyglandular disease. The controls were suffering from chronic bronchitis (2 cases), gastric neurosis (3 cases), lupus vulgaris, amebic dysentery, cardiorenal disease, secondary syphilis, tabes dorsalis, lethargic encephalitis, osteochondroma, peptic ulcer, cholecystitis and diabetes mellitus (1 case each). We found that the duration of the blanching was not so

constant as Csépai states, and varied from ten to thirty minutes. (See Table I.) In fact, this upper limit was observed in 4 of the 15 cases. Further, in one normal case, a girl with chronic bronchitis, there was no definite blanching on one occasion and on another test blanching occurred and lasted for twenty minutes. These discrepancies may be due either to errors in technic or to variations in the strength of the adrenalin solution. It is perhaps opportune here to state that all these tests were carried out by four well-trained interns (Dr. R. D. Taylor, Dr. A. W. Bennett, Dr. R. H. Gray and Dr. E. J. Voigt), who did not know what to expect, and only two of whom studied more than one polyglandular case and two normal controls, so that the personal equation was fairly well excluded. Further, only fresh adrenalin and pituitrin were used.

Exaggeration of the reaction indicates, according to Csépai, a diminished function of the adrenal glands. He noted a blanching of the conjunctiva of thirty-five minutes' duration in 1 case of acromegaly and in 1 case of adiposogenitalis, and of thirty minutes' duration in 1 case of Addison's disease and in 1 case of myxedema. In our series of 6 cases it was normal three times, slightly prolonged (twenty-five minutes) once, and decidedly prolonged (thirty-five to forty-five minutes) in 2 cases. (See Table I.)

Csépai also noted that in the cases in which the adrenalin reaction was positive (*i. e.*, the blanching prolonged) the carbohydrate tolerance was increased or normal. This relation did not hold for our series, for in only 1 of the positive cases was the carbohydrate tolerance increased, while in the other two there was distinctly decreased sugar tolerance.

THE SUBCUTANEOUS ADRENALIN TEST. It has long been known that the subcutaneous injection of 5 mg. of adrenalin is followed by a prompt increase in both diastolic and systolic blood-pressure as well as increase in the pulse-rate. Csépai found an increase of 30 to 60 mm. in the systolic pressure in normal cases. Such a pronounced increase we could not find in our twelve normal controls. Our increase ranged from a maximum of 42 to a minimum of 3 mm., or an average increase for the series of only 17 mm. in the systolic pressure. As a rule the diastolic pressures followed closely the systolic. (See Table I.)

Csépai found in 1 case of acromegaly, in another of dystrophia adiposogenitalis and in another case of myxedema, in all of which the conjunctival reaction was prolonged, no increase in the blood-pressure following the subcutaneous test. Our experience was quite different to this, however, as our 3 cases of prolonged conjunctival reaction showed a slight systolic increase of 10 to 14 mm., a figure, it is true, slightly below our normal controls, but not strikingly so. Further, 2 of the 3 cases with a normal conjunctival reaction showed either a very slight increase of 2 mm. or a very definite one of 28 mm. The third case, with normal conjunctival reaction, had

an actual fall of 14 mm. of systolic pressure, a phenomenon which we are at a loss to explain unless we can assign it to a faulty sample of adrenalin, as the two normal controls which received the same solution gave only a very slight increase in systolic pressure, namely 6 and 8 mm.

Further, Falta[3] has pointed out that the subcutaneous administration of adrenalin causes a distinct leukocytosis, with an increase in the neutrophiles at the expense of the mononuclear and eosinophilic cells. We have applied this test to twelve normal controls (see Table II) and noted a varying degree of leukocytosis in 8 patients, with an average increase of 1180 cells per c.mm., due to a slight increase in the neutrophiles and a corresponding decrease in the mononuclears and eosinophiles. However, in four equally normal patients, as far as the endocrine glands was concerned, there was a decrease in the total white cells, averaging 1200 cells per c.mm. with little or no change in the leukocytic formula.

TABLE II.—ADRENALIN SUBCUTANEOUSLY.

Cases.	Diagnosis.	Blood picture before.						Blood picture two hours after.					
		Total white blood cells, per c.mm.	Polymorphonuclears, per cent.	Lymphocytes, per cent.	Transitions and large mononuclears, per cent.	Eosinophiles, per cent.	Mast cells, per cent.	Total white blood cells, per cent.	Polymorphonuclears, per cent.	Lymphocytes, per cent.	Transitions and large mononuclears, per cent.	Eosinophiles, per cent.	Mast cells, per cent.
	Av. 8 positive controls .	+1,880	76	27.0	1.5	0.75	0	..	78	22.0	1.0	0.3	0
	Av. 4 negative controls .	−1,200	70	25.0	1.7	0.25	0	..	71	27.0	2.5	0.2	0
1	Csépai's acromegaly . .	5,100	38	48.0	4.0	8.0	2	4,800	69	24.0	4.0	3.0	0
2	Csépai's acromegaly . .	6,000	62	33.0	3.0	2.0	0	7,000	67	27.0	1.0	5.0	0
3	Csépai's acromegaly . .	4,700	54	35.0	5.0	5.0	2						
1	" dystro. adip. gen.	5,100	54	39.0	5.0	2.0	0						
2	" dystro. adip. gen.	4,200	31	48.5	12.0	5.5	3	6,800	63	26.6	8.8	1.2	0.4
1	Author's acromegaly . .	6,000	52	35.0	9.5	3.5	..	9,600	61	33.0	6.0	0.0	0
2	Author's acromegaly . .	5,080	62	32.0	4.0	1.0	..	4,200	67	30.0	3.0	0.0	0
3	Author's acromegaly . .	7,900	77	18.0	4.0	..	..	6,200	76	19.0	4.0	1.0	0
	" hyperpituitarism	8,600	69	28.0	2.0	1.0	..	9,800	76	22.0	2.0	0.0	0
1	" dystro. adip. gen.	4,900	70	26.0	1.0	3.0	..	5,600	74	25.0	1.0	0.0	0
2	" dystro. adip. gen.	15,400	78	18.0	2.0	1.0	..	18,200	82	16.0	1.0	...	1

This test was first applied by Csépai to his hypophyseal cases, in which he found either no increase, or, at the most, a slight increase in the total leukocytes, with, however, a slight relative increase of the neutrophiles at the expense of the mononuclears and to a less extent of the eosinophiles. Csépai, therefore, stated that any variation from the normal leukocytosis indicates disease of the ductless glands.

In our series there was only 1 case, and that after operation,

[3] Die Erkrankungen der Blatdruesen, Berlin, 1913, p. 280.

which showed a distinct leukocytosis of 3600 cells with a slight increase of the neutrophiles and a corresponding decrease in mononuclears and eosinophiles. In the other 5 cases there was either no leukocytosis, or, at the most, a very slight one, with an average increase of 584 cells per c.mm. as compared with an increase in our 12 normal cases of 1180 cells, a difference, we believe, too small to be duly emphasized. Further, there was no constant relationship between the effect of the adrenalin upon the blood-pressure and the effect upon the leukocytic formula.

THE CONJUNCTIVAL PITUITRIN TEST. Csépai found that normally drops of the commercial pituitrin as ordinarily used in obstetrical practice when instilled into the conjunctival sac cause no blanching or at the most only a very slight pallor lasting ten minutes. These figures were the result of many observations by Csépai, though he does not state the exact number of patients tested.

We used 12 patients as normal controls (see Table I) and found no blanching, but rather reddening of the conjunctiva in 4 cases, a slight blanching of ten minutes' duration in 3 other cases, while in 5 others the blanching lasted from fifteen to twenty-five minutes. In other words, 7 gave a reaction within Csépai's normal limits, while in 5 it was prolonged and therefore pathological, according to Csépai. He found in 2 cases of acromegaly a prolonged reaction (fifteen to twenty-five minutes), but a normal one in 1 case of acromegaly, 1 of dystrophia adiposogenitalis, 1 of Addison's disease, 1 of myxedema, 1 of Graves's disease and 1 of diabetes mellitus.

In our 3 cases of acromegaly the blanching lasted fifteen minutes in 2 cases and forty-five minutes in 1 case. The reaction was absent or at the most very slight in the secondary hyperpituitarism, and in both patients with dystrophia adiposogenitalis. We further cannot confirm Csépai's observation that when the adrenalin reaction was strongly positive the pituitrin was negative and conversely. We feel rather than the pituitrin conjunctival reaction is not as constant or as reliable as the adrenalin and that many more controls in the normal and diseased states will be necessary before any reliance can be placed upon this test.

THE SUBCUTANEOUS PITUITRIN TEST. Following Csépai's suggestion the effect upon blood-pressure of the injection of 0.5 c.c. of pituitrin was observed. In 1914 he was not ready to publish his own data. Therefore, the 12 normal controls of our own series are the only ones available for comparison with our abnormal cases. (See Table I.) The blood-pressure, both systolic and diastolic, was read at ten-minute intervals for one hour. In Table I only the maximum systolic increase is recorded. This increase varied from 5 to 38 mm., or an average for 11 cases of 15 mm. One normal case showed a fall of 18 mm. without any apparent reason, as both the pathological case and the other normal control showed well-defined increases of the systolic pressure. In other words, the increase of

systolic pressure following 0.5 c.c. of pituitrin is very little less than that following 5 mgm. of adrenalin. Our 3 cases of acromegaly showed an average increase of 7 mm., while the other 3 pituitary cases showed an average increase of 11 mm. in the systolic blood-pressure. There may be therefore a slighter response to subcutaneous pituitrin in patients with acromegaly than in the normal person or even than in dystrophia adiposogenitalis and secondary hyperpituitarism.

TABLE III.—PITUITRIN SUBCUTANEOUSLY.

Cases.	Diagnosis.	Blood picture before.						Blood picture two hours after.					
		Total white blood cells, per c.mm.	Polymorphonuclears, per cent.	Lymphocytes, per cent.	Transitions and large mononuclears, per cent.	Eosinophiles, per cent.	Mast cells, per cent.	Total white blood cells, per cent.	Polymorphonuclears, per cent.	Lymphocytes, per cent.	Transitions and large mononuclears, per cent.	Eosinophiles, per cent.	Mast cells, per cent.
	Av. 7 positive cases	+1,128	75	22	1	0.4	0.2	..	76	23	1	0	0
	Av. negative cases	−1,380	71	26	2	1.0	0.2	..	71	26	2	1	0
1	Author's acromegaly	7,800	60	35	3	2.0	..	6,400	60	28	9	3	0
2	Author's acromegaly	5,800	69	26	5	0.0	..	5,700	73	23	2	1	1
3	Author's acromegaly	6,200	71	27	2	0.0	..	6,400	68	29	3		
	" hyperpituitarism	8,600	67	32	1	0.0	..	8,400	70	29	1		
1	" dystro. adip. gen.	5,900	64	34	2	0.0	..	4,900	68	32			
2	" dystro. adip. gen.	9,600	78	19	1	2.0	..	14,400	73	26	1		

The effect upon the leukocytes two hours after the injection was noted by us in 12 normal cases. (See Table III.) In 7 of the cases there was an average increase of 1128 cells, with a slight increase in the neutrophiles but no change in the mononuclears or eosinophiles. In 5 cases, however, there was a distinct decrease in the total white cells averaging 1380 cells, but again practically no change in the blood formula. In all 3 cases of acromegaly, as well as in the case of secondary hyperpituitarism and 1 case of dystrophia, there was a slight but definite decrease which averaged 500 cells per c.mm. There was practically no change in the blood formula. In the case of dystrophia, with an associated pelvic cellulitis, there was a distinct leukocytosis.

CONCLUSIONS. 1. That a secondary hyperpituitarism may result from a greatly or rapidly increasing intracranial pressure, as in Case IV of our series.

2. That the determination of a decrease in the sugar tolerance in the presence of other symptoms of disturbance of pituitary function justifies a diagnosis of increased activity of the pars intermedia.

3. That the adrenalin conjunctival test may be of positive value in certain cases of dyspituitarism in demonstrating a hypofunction of the chromaffin system.

4. That the subcutaneous adrenalin test was only of doubtful value in both the normal and diseased cases studied by us.

5. That both the conjunctival and subcutaneous pituitrin tests were too equivocal to be depended upon for studying the functional activity of the hypophysis.

6. That the internal administration of the pituitary extract of either the whole gland or the anterior or the posterior lobes appears to exert no definite influence upon the symptomatology of the disease.

THE PROBLEM OF NUTRITION AND A SATISFACTORY METHOD OF FEEDING IN HIGH INTESTINAL FISTULAS.

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The problems presented by high intestinal fistulas may be roughly divided into two groups: The first, which concerns both the surgeon and the internist, is the question of nutrition, and the second, of special interest only to the surgeon, is the successful closure of the fistula. The object of this paper is to offer a satisfactory solution of the first problem, namely, a method to supply adequate nourishment to patients suffering from this condition.

High intestinal fistulas, by which we mean external fistulas involving the duodenum, jejunum and upper ileum, are frequently seen in any large hospital service and appear occasionally in the practice of most surgeons and internists. Of the etiological factors, one of the most common is appendicitis, with abscess or infected mesenteric thrombosis. Tuberculous peritonitis involving the intestine is notoriously prone to develop fistulas, particularly after operative intervention. Traumatic injuries, with primary perforation or with intestinal devitalization and secondary perforation occurring both from extra-abdominal causes and in the course of a laparotomy, have led many times to the same condition. Enterostomies are frequently performed when the patient is *in extremis* from strangulated hernia, paralytic ileus or other intra-abdominal obstruction, and often the physical condition must be greatly improved before a secondary operation to close the defect can be made. Finally, we have the malignant growths, which, following exploration, involve the adjacent abdominal wall and ulcerate through. The final outcome is, of course, hopeless, still much can be done in the way of suitable nourishment to make life more comfortable.

The necessity of some method for the successful introduction of foods is evident to anyone who has had charge of these cases. The fluid loss alone is a serious one. While some fluid is probably ab-

sorbed throughout the whole of the small intestine, a considerable portion is absorbed in the large gut, and since the material escaping from high intestinal fistulas is always fluid, serious dehydration cannot help but take place. This loss of water not only depletes the body of an essential constituent, but places an additional burden on the kidneys, lowers the resistance to infection and is frequently the cause of much distress from thirst.

The constant escape of fluids bearing pancreatic and intestinal secretions, together with foods in process of digestion, causes a marked excoriation of the skin surrounding the fistula. The application of vaselin, zinc oxide, talc, rubber in solution, etc., which is recommended by nearly all writers, does not prevent this moist eczema, and warm baths only allay the condition temporarily. It is only in exceptional cases that the introduction of a rubber tube to drain away the secretions or the insertion of a vaselined gauze plug is successful. A method which permits the withholding of fluids and food by mouth, while not entirely preventing the escape of irritating secretions, lessens the discharge enormously and helps materially in clearing up the skin condition.

The loss of food products is second only to that of fluids, if in fact it is not more important, since fluid alone can be introduced for some time by other routes, and in the upper intestine the absorption of water is greater in proportion than the absorption of products of digestion. In jejunal and high ileal fistulas the food is still in process of cleavage, so that even if absorption above the fistula were adequate, much of the material is in too complex a form to be assimilated. The loss includes all three essential foods—carbohydrates, fats, and proteins—besides the inorganic salts and possibly some of the little understood substances commonly known as vitamines. The gravity of this loss is evidenced by the rapid emaciation and loss of strength so frequently seen in patients with no other drain on their physical well-being than a fecal fistula. If we add to this the deleterious action of some of the etiological agents mentioned above, we will realize the hazardous position in which the patient is placed and the necessity to overcome the obstacles to proper nutrition as rapidly as possible. Not only is the patient less able to cope with severe infections, but he may be in most unfavorable condition to withstand operative closure of the defect. We have here a vicious circle, the loss of intestinal contents progressively weakening the patient and demanding more and more the closure of the fistula, while the decreasing vitality makes the operation constantly more dangerous. The answer would be simple if these cases were always seen at a time when the ill-effects of undernourishment were not marked; but, unfortunately, this is not the rule. On the other hand, some cases, due to the preëxisting disease, are in too precarious a condition at the time the fecal fistula develops to undergo surgical treatment.

Attempts have been made to control the amount of discharge from a fecal fistula by frequent feeding of small amounts by mouth. While this is undoubtedly of some benefit, the results, especially in the jejunal fistulas, are discouraging.

Attempts to artificially restore the continuity of the intestinal canal by passing a rubber tube from the upper segment to the lower have been successful in only a small proportion of cases. This result is to be expected, since in only a small percentage will the fistulous tract be sufficiently open to make the insertion of a tube into each end of the gut possible. The opening resulting from emergency operations, such as enterostomies (artificial anus), is practically the only type in which the above method can be used, as a tube large enough to fill the intestinal lumen is needed, otherwise there is a pronounced leakage.

Rectal alimentation is serviceable for only short periods and has many limitations. Some cases of low fecal fistula which had persisted for long periods have closed spontaneously in a comparatively few days when food by mouth was discontinued and rectal feedings given. None of those reported appear to have been in serious condition from inanition and the actual value of the rectal administration is problematical, although the beneficial action on the fistula of the empty small intestine is unquestioned.

Recent work has cast considerable doubt on the efficacy of the ordinary nutrient enema. Fats are probably not absorbed in any form from the large intestine. Protein, either in the form of whole milk or as peptonized milk, is recommended by most writers, and will be found in general use in nearly every hospital. Even raw eggs are included in the formulas by many. The evidence, however, is strongly against the value of plain milk or eggs, since no proteolytic enzymes other than bacterial exist in the large intestine, and the latter certainly cannot be depended upon.

The value of thoroughly peptonized milk cannot yet be definitely stated, since the experimental work on the subject is still incomplete. Clinical evidence seems to point strongly in its favor, but more careful investigations recently conducted indicate that only amino-acids are absorbed in the colon and that the proteins in peptonized milk are not sufficiently split to allow of their utilization by the body. Amino-acids are not obtainable on the market in sufficient quantity for rectal alimentation, and if they were the price, at least at present, would be absolutely prohibitive.

The evidence is also incomplete in reference to the absorption of milk and cane sugars. Glucose, however, is evidently readily utilized. Five to 10 per cent. is recommended, and its incorporation in all nutrient enemas urged. We can only say that, so far as our present knowledge goes, nutrient enemas should contain glucose, leaving the question of adding peptonized milk to the individual physician. The former can be depended upon to furnish many

calories and to conserve the body fats and proteins, while the latter may be proved by further experimentation to be unsuitable for rectal alimentation.

The question of the absorption of sufficient calories is not the only one which confronts us in dealing with this problem. The irritability of the rectum is well known and constitutes a serious handicap in colonic feeding. This irritability varies with different individuals, but seldom is a patient found who can tolerate the continued introduction of either saline or tap water by rectum for more than three or four days. A very small soft-rubber catheter causes less irritation than the usual rectal tube and the tendency for prompt expulsion of the enema is less. In the same way the introduction of small quantities of fluid, at the proper temperature and under very low pressure, increase the chances of its retention. These, in fact, are the essentials of the Murphy drip and explain why it is so successful for limited periods. Large amounts of fluid are almost certain to be rejected by the colon after two or three injections, while the continued use of small amounts, even when administered in the most favorable way, soon produce irritation and the hypersensitive colon refuses longer to act as a stomach. These facts applied to rectal alimentation show us the fallacy of expecting more than temporary benefit from this method, for the rectum and colon will not tolerate the quantity of fluid sufficient to carry the required number of calories nor the introduction of small amounts at the short intervals necessary to obtain the same result.

The method of feeding in high intestinal fistulas, which the author has found most successful, has probably been used by many operators; but it does not seem to be generally known, and in a recent review of the literature only one reference to it was found. This was by Fowler[1] in Johnson's *Operative Therapeusis*. In speaking of feeding in cases of artificial anus he says: "An attempt may also be made to place predigested foods in the efferent loop of the fistula. If this is possible it not only nourishes the patient better but prevents contraction of the portion of the bowel below the fistula. Reverse peristalsis tends to prevent feeding through the efferent loop." Under a discussion of fecal fistula he states: "When the opening is situated high up in the intestinal canal and the condition of the patient is such that an operative procedure is contraindicated, a temporary expedient of inserting a rubber tube, on the same principle as that employed by Kerr in draining the bile ducts, may be employed. In a personal case this simple device effected an absolutely mechanical closure and tided the patient over until sufficiently recuperated to withstand a formal operation. Nutrition was maintained through a small catheter inserted through a minute opening in the wall of the larger tube into the efferent intestine."

[1] New York, 1916, iv, 348–350.

In the author's experience he has had no difficulty with reversed peristalsis. This is possibly due to the use of a very small soft tube and its insertion for several inches down the efferent loop.

The method found most successful for intestinal fistula is essentially the same as is used for rectal feeding, but has not the limitations which hamper the latter. A very small soft rubber catheter, preferably lubricated with olive or sweet oil, is carefully inserted through the fistulous tract into the distal loop of intestine. No attempt should be made to force the tube in, but by gently turning the catheter about it will usually pass with little or no difficulty. At first it may pass into the upper loop, and in some cases it is impossible to determine at once which loop it has entered. If in the upper loop, intestinal contents soon appear through the catheter or the material injected is promptly expelled. As a general rule, however, no difficulty will be found in passing the tube into the lower segment. It should enter for three or four inches at least, and with five or six inches the tendency for the fluid introduced to flow back around the catheter is practically negligible.

The food for introduction must, of course, be fluid, and any particles liable to obstruct the small opening in the catheter should be carefully removed. It should be warmed slightly above body temperature, otherwise marked peristalsis may set up and the gut temporarily occluded. We have found the administration of three or four ounces every hour during the day and at two- or three-hour periods during the night to be very satisfactory. Larger quantities are more liable to cause irritation and possibly reversed peristalsis. The fluid can also be given readily by the Murphy drip. Whatever method is used, the administration should be slow and the fluid allowed to flow in by gravity. A height of six inches is usually sufficient to overcome the intra-abdominal pressure. The tube may be inserted at each feeding or left *in situ*. If insertion is easily performed we advise the introduction only at feeding times. When difficult, requiring the experience of the surgeon to insert it, the tube may be left in place, and being very small and soft, will probably cause little irritation.

Unlike rectal alimentation the enteric feeding in intestinal fistula is not confined to very simple products. Whole milk can be given freely, but should be peptonized. Raw eggs are tolerated, but it seems best to partially digest them as well. Beef juices are recommended, especially from thoroughly crushed meat forced through a strainer. This furnishes a large amount of protein from the muscle cells pressed out, and being free from connective tissue, passes readily through the catheter.

Glucose in 5 per cent. solution should always be added to the formula. Whisky may be added when indicated. The salts and vitamines will be furnished by the milk and beef juices. When much bile escapes from the upper loop, some of this should be col-

lected and introduced with the feedings. Oatmeal broths and other farinaceous-bearing fluids can be safely given if desired. In threatened acidosis, alkalies may be introduced as readily as per rectum. This type of feeding can be continued indefinitely and the patient brought back to good physical condition before a secondary operation need be performed. It also prevents contraction of the gut below the fistula, a great help in the after-treatment of these cases.

CONCLUSIONS. The problem of nutrition in high intestinal fistulas is a serious one. The loss of fluids and products of digestion steadily lowers the patient's resistance to infection, and so weakens his physical condition that operative interference is extremely hazardous. The administration of small amounts of food by mouth does not materially improve the condition. Mechanical measures to conduct the fluids from the upper to the lower intestinal loop or to occlude the fistulous tract are successful in only a very small number of cases. Rectal alimentation has many limitations, chief of which are the failure of absorption of sufficient calories and the short time the colon will tolerate nutrient enemas. Enteric administration of foodstuffs through a small, soft catheter, inserted by way of the fistula into the efferent loop, is successful. By this method sufficient calories are utilized to maintain a good, physical condition and to build up an emaciated patient, so that he can withstand necessary operative treatment.

LATER STAGES OF SO-CALLED WAR NEPHRITIS.

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THE unusual number of cases of acute nephritis occurring in the various armies overseas has been the subject of much comment and study. It has been maintained by some authors, notably Ameuille,[1] that war nephritis constitutes a hitherto unrecognized clinical entity, differing in some respects from nephritis as ordinarily seen in civil life. This opinion is not shared by others. Christian,[2] after reviewing the literature of the subject, concludes that "war

[1] Translation by Mosenthal: Jour Urol., 1918, ii, 51.
[2] Prog. Med., 1919 xxi, 135.

nephritis" is not a new disease entity but represents a wide variety of the clinical manifestations of acute nephritis.

During the past few months the Base Hospital at Camp Lee, Va., has received a number of such patients in whom the duration of the disease averaged a little under four months. The clinical findings of these patients at this stage of convalescence offer some data bearing upon the course and prognosis of the disease. Our cases were studied too late to present much evidence bearing on the question of the nature of the original attack.

Thirty-seven patients were received at this hospital from overseas with a diagnosis of nephritis. Our investigation of these patients brought out the following facts:

Period Since Onset. The period that had elapsed since the onset of the disease until admission varied between two and seven months, averaging 3.8, but in 75 per cent. of the cases ranged from three to five months. The length of stay in the hospital averaged a little over three weeks, so that most of the observations were made about the fourth month.

Past History of Nephritis. 3 of the 37 patients had had previous attacks of nephritis. Of these 2 recovered from the present attack and 1 was found to have well-developed chronic nephritis.

Edema. 35 of the 37 had edema at the onset. Of the 2 who did not, 1 had a chronic nephritis, dying at this hospital of uremia, and 1 had apparently recovered. At this hospital edema was found in but 2, both having chronic nephritis.

Focal Infection. Teeth and tonsils were examined in 26 cases. Foci of infection were found in 13 of these (50 per cent.), tonsillar disease being present in 10 and root infection in 4.

Albuminuria. Albuminuria was found to be present in 31 cases (83 per cent.), and persisted in 24 (64 per cent.). In the absence of other indications of nephritis these patients were considered to have recovered.

Cylindruria. Cylindruria persisted in 16 cases (43 per cent.). This factor was also practically disregarded.

Sodium Chloride Excretion. Sodium chloride excretion was found to be normal in nearly all the cases in which it was estimated. In 26 patients the average excretion was 9.5 gm., only 7 excreting below 7 gm., all of these being over 5 gm. except one, who excreted but 0.5 gm. during an acute exacerbation of the disease, the salt intake at this time, of course, being much restricted.

Nitrogen Excretion. Nitrogen excretion was estimated while patients were on a full ward diet in 24 cases. The average output was 10 gm. In 7 cases the output was below 8 gm., the lowest figure being 6 gm.

Twenty-four-hour-urine Output. The urine was measured in 34 cases. It exceeded 1500 c.c. in 7 cases. In 5 of these 7 cases there was ample evidence of impaired kidney function; 1 showed

nycturia and hyposthenuria as the only other evidence of kidney involvement, while 1 was normal in every other respect. Oliguria was pronounced in 3 cases during acute exacerbations of apparently chronic nephritis; 11 excreted less than 1000 c.c. The average twenty-four-hour-output was 1229 c.c.

Amount of Day and Night Urine. The amount of urine excreted between 8 A.M. and 8 P.M. was compared with the amount excreted between 8 P.M. and 8 A.M. in 33 cases. The night urine exceeded 50 per cent. of the day urine in 27 cases (81.8 per cent.). It exceeded 75 per cent. of the day urine in 19 cases (57.5 per cent.). In 4 it equalled or exceeded the day urine.

Specific Gravity of Day Urine. Maximum was over 1.018 in 28 cases, between 1.015 and 1.018 in 1 case and under 1.015 in 7 cases.

Specific Gravity of Night Urine. This was above 1.018 in 18 cases, between 1.015 and 1.018 in 3 and below 1.015 in 13 cases. Of the 13 cases with a night urine below 1.015, 12 had other manifestations of kidney involvement and 1 did not. Of the 3 between 1.015 and 1.018, 2 had recovered and 1 still showed other evidences of pathology; 76 per cent. of the active cases and 17 per cent. of the recovered passed night urine of a specific gravity of less than 1.018.

Two-hour Variation in Concentration. This variation was studied in 35 cases. Variations of less than 6 points were noted in 13 patients. Of these 7 still had nephritis and exhibited decidedly lower maximum concentrations than the 6 who had recovered. In this series fixation of specific gravity without hyposthenuria appeared to be of little significance.

Blood Urea. Blood urea was estimated in 35 cases; of these 11 showed a concentration of 35 mg. or more per 100 c.c., while 24 showed lower figures. Two of the 11 with blood urea above 35 mg. (38 mg. and 40 mg.) had apparently recovered while the other 9 still had nephritis. Of course a number of patients with blood urea below 35 mg. were definite nephritis cases. The findings are tabulated in Table I.

TABLE I.—BLOOD UREA (MG. PER 100 C.C. BLOOD).

330 mg.		1 (died)
230 "	(later reduced to 110)	1
190 "		1
134 "		1
80 to 90 "		1
50 to 60 "		1
40 to 45 "		1
35 to 40 "		4
30 to 35 "		3
25 to 30 "		2
20 to 25 "		9
25 to 20 "		6
Below 15 "		4

The Phenolsulphonephthalein Test. This test was done in 36 cases. Table II shows the results. A moderate depression was not uncommon in soldiers who showed no other signs of nephritis. Thus of the 8 with a reading between 40 and 50 per cent., 5 had apparently recovered. Of 11 below 40, 2 had recovered and 9 had not.

TABLE II.—PHENOLSULPHONEPHTHALEIN OUTPUT IN TWO HOURS AND TEN MINUTES.

70 to 80 per cent.	1
60 to 70 "	4
50 to 60 "	12
40 to 50 "	8
30 to 40 "	3
20 to 30 "	1
10 to 20 "	1
0 to 10 "	6

Systolic Blood-pressure. Systolic blood-pressure was estimated in 37 cases. Of the 12 cases with a reading of 140 or over, 10 (83 per cent.) still had nephritis, the other 2, in whom the maximum reading just touched 140, showed no other signs of nephritis. On the other hand 6 (24 per cent.) of the 25 whose blood-pressure never reached 140 were nevertheless considered active cases. They were much milder in type, however, than the patients with higher readings, and were practically all convalescing and seemed quite likely to recover entirely.

TABLE III.—SYSTOLIC BLOOD-PRESSURE.

Over 200	2
190 to 200	0
180 to 190	2
170 to 180	1
160 to 170	2
150 to 160	1
140 to 150	4
130 to 140	9
120 to 130	8
110 to 120	6
100 to 110	2

Diastolic Pressure. Diastolic pressure exceeded 100 in 8 cases; 6 of these were well-marked cases of nephritis, 1 had slight corroborative evidence of activity and 1 had apparently recovered; 11 active cases had a diastolic pressure below 100.

Eye-grounds. Four showed pathology in the eye-grounds. Hemorrhages were found in 2, albuminuric retinitis in 2, retinal edema in 1 and papilledema in 1. They were all well-marked cases.

Anemia. A moderate degree of anemia was common. The erythrocytes were counted in 22, of whom 17 had less than four million.

Four to five million was the commonest count. The average was 4,147,500.

TABLE IV.—ERYTHROCYTES.

1,000,000 to 2,000,000	1
2,000,000 to 3,000,000	2
3,000,000 to 4,000,000	5
4,000,000 to 5,000,000	9
5,000,000 to 6,000,000	5

Outcome. A diagnosis in these patients was determined by the complete picture in each case, no one factor exclusively being considered pathognomonic. Of the 37 cases, 19 were discharged as having completely recovered and 18 showed definite evidence of kidney pathology. The time that had elapsed since the onset of the disease was practically identical in these two groups, averaging 3.85 months for the former and 3.75 months for the latter. Of the 18 active cases, 1 died of uremia, 8 presented the picture of well-established, chronic, interstitial nephritis and 9 showed less distinctive features and seemed to have a fair chance of ultimate recovery.

SUMMARY. 1. Thirty-seven cases of nephritis contracted overseas were studied at a period averaging four months.

2. One-half have recovered, one-quarter have developed chronic nephritis (with one death), one-quarter still have nephritis but may ultimately recover.

3. Persisting albuminuria is common but is considered of little prognostic significance.

4. Polyuria is not uncommon, and when it occurs is a valuable sign.

5. Relative increase of night urine is practically constant in active cases and is not infrequently the only anomaly in the apparently recovered.

6. Blood urea above 35 mg. per 100 c.c. usually meant nephritis, as proved by other factors. Normal readings were frequently found in active cases.

7. Moderate reductions of phenolphthalein output is not an uncommon finding in those patients who have apparently recovered.

8. An elevated blood-pressure proved the most reliable single sign.

9. A moderate degree of anemia is extremely common.

LETHARGIC ENCEPHALITIS IN THE A. E. F.: A CLINICAL STUDY.

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Lethargic encephalitis, so-called, has been a subject of considerable study and speculation on the European continent since the spring of 1917, and though the disease appeared in a more or less epidemic form, its association with any other current epidemic was not established. Case reports were justifiable, as they conformed, in the main, with the simple descriptive term—lethargic encephalitis; but the clinical pictures were varied, particularly in mode of onset and course; they did not spare any part of the central nervous system and the range of mortality varied from 20 to 50 per cent. (British report,[1] Netter,[2] Findlay,[3] von Economo[4]). The results of pathological investigation have been fairly uniform, in that the central nervous system presented an inflammatory process resembling that of syphilis, poliomyelitis and relapsing fever, with a tendency to selection of the basal ganglia, midbrain and the bulb. Up to date no pathogenic agent has been established, though the bacteriological investigations of Bradford, Bashford and Wilson,[5] in which a filtrable virus, isolated from brain tissue, and resembling that found in acute infectious polyneuritis, may point the way.[6] Lethargic encephalitis has become a reportable disease in British public health work.

In the United States interest was directed to this mysterious disease during and soon after the height of the last epidemic of influenza, and the literature of case reports is now becoming extensive. A number of deaths have already occurred in New York City and elsewhere, but the results of pathological and bacteriological investigations are still forthcoming and are being awaited with considerable interest for comparison with the findings of European observers.

[1] Report on an Inquiry into an Obscure Disease, Encephalitis Lethargica, Local Government Board Reports on Public Health and Medical Subjects, London, N. S., 121.

[2] Lethargic Encephalitis, Bull. Acad. de méd., May 7, 1918, lxxix, 337; Paris méd., August 3, 1918, viii, 81.

[3] Lethargic Encephalitis, Glasgow Med. Jour., October, 1918, xc, 193.

[4] Verein f. Psych. u. Neur. in Wien, April 17, 1917; Wien. klin. Wchnschr., May 10, 1917; Neurol. Centralbl., November 1, 1917.

[5] British Med. Jour., London, February 1, 1919, No. 3031, vol. i.

[6] Attention has been recently directed to the work of Drs. I. Strauss and L. Loewe, at Mt. Sinai Hospital, New York City (Etiology of Epidemic Encephalitis, Jour. Am. Med. Assn., October 4, 1919), wherein it is claimed that a filtrable virus was isolated from the nasopharynx of patients suffering from epidemic encephalitis. This organism resembles in morphology, appearance of colonies and growth that described by Flexner and Noguchi in poliomyelitis, and has up to date been carried to the twelfth generation.

With the American overseas forces this new disease picture has been so infrequently met with and of such comparatively recent observation that it has aroused a sporadic interest only. If, as seems to be the general consensus of medical opinion, this disease has followed in the wake of the influenza epidemic, it is interesting to note that the American overseas forces, which have not been altogether spared by the scourge of influenza, should have seen so little of lethargic encephalitis. We have become familiar with the usual transient nervous manifestation associated with influenza; the concomitant delirium, the residual neurasthenic and psychasthenic states and often the latent psychoses precipitated by acute infection. There is, however, a tendency, as noted in some of the cases reported as lethargic encephalitis, to include some of these disorders, which must add to the perplexity already existing in the attempt to establish a distinct clinical entity. In a recent communication by Menninger[7] on the psychoses associated with influenza in Boston, a review of nearly 100 cases, wherein the central nervous system was involved, no symptoms referable to our present conception of the lethargic encephalitis were considered. This leads one to question the relationship which may exist between lethargic encephalitis and influenza. On the other hand the observations of Bassoe[8] in Chicago, Mayer[9] in Pittsburgh, and Neal[10] in New York, offer a more pertinent basis for epidemiological consideration.

During the months of January, February and March of this year, G. H. Q. Base Hospital No. 90 had about 10 cases, which were considered as belonging to this group, because of definite involvement of the central nervous system associated, in most instances, with unmistakable lethargy. The majority of these cases were later seen and considered by other observers as those of lethargic encephalitis, but aside from the main features which seem to legitimize this diagnosis, the variability of the general clinical pictures and their resemblance to other well-recognized diseases of the nervous system were so striking as to call forth considerable discussion and divergence of opinion. The results of these clinical studies form the basis of this communication.

Case I.—Pvt. (1st class), M. G.; M.D., B. H. 90. Admitted to B. H. 90 January 28, 1919.

History. Always of delicate physical constitution and inclined to be nervous. Present illness: "Bad cold" during first week in January and following a short leave to southern France, he thought

[7] Psychoses Associated with Influenza, Jour. Am. Med. Assn., January 25, 1919.
[8] Jour. Am. Med. Assn., March 1, 1919, lxxii, 677.
[9] Post-Influenzal Disturbances of the Nervous System, Jour. Am. Med. Assn., March 1, 1919, p. 670.
[10] Meningeal Conditions Noted during the Epidemic of Influenza, Jour. Am. Med. Assn., March 8, 1919, lxxii, 714.

he had recovered. After returning to duty he coughed excessively, but was not incapitated. Two days before admission to the hospital, while sitting in the squad-room, he felt a sudden and sharp pain in the back of his head; objects appeared blurred and he saw double. He felt weak and unable to return to his quarters without assistance. On the following day, headaches, horizontal diplopia to the left, swallowing difficulty, requiring liquid food (no sore-throat), buzzing in both ears and twitching of the right facial and shoulder muscles. He felt a heaviness of his face and eyelids; was very drowsy and weak.

Examination on Admission. Very somnolent, but when stimulated his sensorium was not clouded. Temperature ranged from 100° to 102° (afternoon). Poor muscular development; chest elongated; skin dry and harsh. Marked drooping of both upper lids, with corrugation of the forehead, right internal strabismus and diplopia, pupils markedly dilated, but react promptly; all extra-ocular excursions were slow and restricted; eye-grounds normal. Swallowing retarded and difficult; no rigidity of neck or Kernig. Deep reflexes increased; pseudo-Babinski on the left; no clonus; abdominals present; no nerve or muscle tenderness; sensation and deep sensibility unimpaired. Marked weakness and ready fatigue. Lungs: dulness and fine crackling rales in right apex; no thymic dulness. Sputum and roentgen ray of chest negative; throat culture; blood count and urine negative. Spinal fluid, five cells, trace of globulin; Wassermann, blood and spinal fluid negative.

Clinical Course. Was kept absolutely at rest; continued to run an afternoon temperature for about a week, with an occasional chill, temperature reaching 103°. The ocular weakness and ptosis gradually cleared up. Marked constipation, requiring massive doses of cathartics with enemata. After a few weeks the most pronounced feature was his ready fatigability on the slightest exertion, though while at rest he did not complain. Two months after admission he presented a general constitutional improvement, though his physical reduction was evident. Gait was weak, and walking a few yards was followed by general exhaustion, requiring long rest for recuperation. There was still a right internal rectus paresis, which failed completely upon convergence. Faradic stimulation of the extensors of hands and fingers was followed by a ready exhaustion (myasthenic reaction of Jolly). Seen by Lieut.-Col. Zabriskie on March 26, who considered the case one of lethargic encephalitis, with a myasthenic picture.

In this case there was an abrupt onset, an early febrile period of about a week, with bulbar symptoms, which during further course and with absolute rest showed a fairly rapid improvement. There remained, however, a sustained and ready fatigability on the least exertion, with a myasthenic electrical reaction. Aside from the abrupt onset this case presents a picture difficult to

distinguish from myasthenia gravis, and, as was learned later, after transfer of the patient to Savenay for discharge to the States, there was considerable divergence of neurological opinion as to the ultimate classification of this case.

CASE II.—Cook, M. A., P. W. E. 233. Admitted to B. H. 90 from C. H. 38, January 30, 1919, with diagnosis of "psychosis, exhaustive possible specific."

The card of admission to the C. H. on January 27 stated influenza and eye trouble, but no further information.

History (from patient). Following a motor-cycle accident, about two weeks before admission, when he was struck on the left knee, being shaken up but not seriously hurt, he began to suffer a gradual and progressive failure of vision and of seeing double; also frontal headaches, mental dulness, unsteadiness of gait and general nervousness. He added that it took him several hours in the morning before he could dress or feel clear as to his surroundings. No history of vomiting, loss of motor power or sphincter control. Denied venereal disease or any acute illness preceding.

Examination. Able to be out of bed, but gait was slow, hesitating, with a tendency to incline forward and to the left. Appeared very dull and fell asleep during the examination. Sensorium was definitely clouded, being particularly disoriented for time and recent events; remote memory was also impaired and thinking difficulty was very apparent. All responses were sluggish, and he handled figures slowly and incorrectly. Vision: though he complained of failing vision, he could count fingers at a distance of a foot, but was unable to read large print or to write. Fundi were reported normal. Pupils were markedly dilated, right slightly larger than the left, regular, and react well to light, but poorly to accommodation; consensual present. All extra-ocular movements slow, horizontal diplopia to the right, but no definite palsies or nystagmus. Face ironed out and mask-like, with static overaction of the whole right side; facial movements slow, but there was no definite palsy on the left. Speech low, monotonous and physically restricted. Tongue protruded in the midline, and swallowing was slow and infrequent. Motor power in both upper and lower extremities, generally but equally diminished in all segments; movements slow and restricted. All deep reflexes exaggerated; no Babinski, but definite and inexhaustible ankle-clonus on the right; abdominals active and equal. Sensation and deep sensibility unimpaired; no ataxias. Fine static tremors of the face and muscular twitchings of the right thigh and leg muscles. Temperature, afternoon and evening, ranged from 99.4° to 101°; pulse 60 at rest, but very labile on change of posture, with an occasional tachycardia. Laboratory: Blood: white blood cells, 17,400; polynuclears, 82 per cent. (eosinophiles, 3 per cent.; neutrophiles, 79 per cent.); small mononuclears,

15 per cent.; large mononuclears, 2 per cent.; transitionals, 1 per cent. Hemoglobin, 90 per cent. Spinal fluid, recumbent posture, moderate pressure, colorless, clear, 20 cells (96 per cent. mononuclears, 4 per cent. polynuclears); globulin increased; culture and stain for tuberculosis negative; Wassermann, spinal fluid and blood negative; urine negative.

Clinical Course. Temperature continued for eight days, patient becoming more dull and stupid. He complained of insomnia at night, though during the day he was drowsy, eyes shut and apparently sleeping; also complained of vertigo; no headaches. There was continued blurring of vision for near objects; right V., 20/30; left V., 20/40; form fields, media and fundi remained normal. Pupils as noted on first examination. Both internal recti failed altogether on convergence. When a strong light was placed before his eyes there was a spontaneous lateral nystagmus, with slow component to the left. Facial inequality still present and both gaze and facial expression more fixed. When standing, head and shoulders were bent forward and rigid; arms akimbo; thumbs and fingers in approximation; extended and assuming "pill-roll" attitude. Mild rigidity noted on passive movements.

A month after admission his inactivity became more pronounced and the above Parkinsonian features more in evidence, but mentality had cleared up. Was losing weight; perspired a great deal; skin oily, and oftentimes perspiration was limited to the left side of the face. He was unable to laugh, smile or be stimulated emotionally; facial expression more fixed and staring, with infrequent blinking and speech more inaudible. Rigidity definite in the neck and back, and to a lesser extent in the extremities. Tremors frequently observed in face and both lower extremities, more on the right. While sitting with the feet touching the floor there was a spontaneous ankle-clonus on the right, but examination did not disclose any other signs of pyramidal tract involvement. Gait slow, at times shuffling; was able to run slowly but without propulsion or retropulsion. His condition vacillated; at times he gave the impression of brightening up, but within a few hours he would relapse. Was seen by Lieut.-Col. Zabriskie on March 26, who pronounced the condition as a fairly typical Parkinson picture in a case of lethargic encephalitis. When noted on April 25 the condition remained stationary.

CASE III.—M. D., aged twenty-seven years. Pvt., M. G., 327 Inf. Admitted to B. H. 90 March 2, 1919, from C. H. 64, for refraction.

The eye findings were reported as completely negative and the patient was transferred to the neurological department for mental observation.

History. No history of any serious illness or trauma; venereal disease denied. In France six months; was exposed to shellfire but not affected. About two months ago had a "hard cold," but

was sick only a few days; no chills or fever. Present illness: Six weeks ago had sudden onset of headaches, generalized and severe, dizziness and this followed by gradual closure of eyelids. Felt sleepy during the day but was unable to sleep at night. This continued for two weeks and following lumbar puncture at the camp hospital, his headaches subsided; eyes opened and he found he could see well. He then developed stiffness in the left shoulder and arm; noticed a change in his speech, which he was unable to describe, and remarked especially about his inability to laugh or smile.

Examination on Admission. Complained of insomnia, "general laziness" and stiffness in the left upper limb. He held himself very rigid; trunk bent forward; gait slow but steady. Face was very mask-like; gaze fixed and blinking infrequent. Vision, pupils and all extra-ocular movements presented no abnormalities. Facial movements carried out with difficulty; unable to wrinkle forehead, smile or be stimulated. Speech was low, muffled, restricted and frequently inaudible; there was accumulation of saliva, but swallowing was infrequent and retarded. Voluntary movements slow but motor power good and equal in all extremities. Reflexes, deep and superficial, were normal. Left upper extremity flexed at the elbow; thumb and forefingers approximated. Mild rigidity on passive movements; the latter was also noted in the neck. Sensation and deep sensibility unimpaired; no ataxia. When asked to do an "about face" he did it very slowly, with a tendency to sway and fall in all directions. Tremors of both lids on shutting the eyes. Temperature normal; patient did not complain of being ill. White blood count was normal; no eosinophilia; spinal fluid, 5 cells; slightly increased globulin; Wassermann of both spinal fluid and blood negative.

Clinical Course. After a month in the hospital he showed some improvement; face still remained stolid; no paralysis. Gait slow; body bent forward, but more plastic. Eyes brighter and effort to smile partly successful. Speech still monotonous, but less restricted. Seen by Lieut.-Col. Zabriskie on March 26, at which time the case was considered as one of lethargic encephalitis and the Parkinsonian picture gradually clearing up. He continued to show a gradual improvement when noted on April 25.

In Cases II and III we have fairly well-defined Parkinsonian pictures, one remaining stationary after three months' residence in the hospital and the other gradually recovering. In both the onset was fairly abrupt, with the possibility of an acute infection preceding, though neither the inadequate histories or the clinical evidence on admission to this hospital bears out the suspicion of influenza. Further, one may note a period of a few weeks intervening between the "bad cold" and the onset of present illness in Case III, which appears to be recovering. The history of trauma in Case II, which is most marked, and showing a tendency to progression of the dis-

ease, is of special interest in that physical and emotional trauma are frequently cited as a precipitating factor in paralysis agitans.

CASE IV.—Z. G. (Italian), aged twenty-six years. Pvt. Co. H, 308 Inf. Admitted to B. H. 90, medical service, January 7, 1919, with a diagnosis of "N. Y. D.; temperature 103°." No further information.

Examination. On admission, medical: Temperature, 102°, and the most marked feature noted by the internist was "lethargy and mental torpor;" neck slightly rigid; a suggestive Kernig; abdomen somewhat tympanitic; tongue coated; bowels moved with purgation and enemata; no enlargement of spleen; a few suggestive spots on his back.

Laboratory Report. Blood culture negative for typhoid or other organisms; stool negative for typhoid (all forms); urine culture negative. White blood cells, 16,000; 60 per cent., polynuclears; 4 per cent. eosinophiles; spinal fluid, 680 cells (unfortunately no differential was made); negative stain for tuberculosis.

Clinical Course. Temperature ranged from 100° to 102°, with gradual drop to normal in about two weeks. Patient complained of pain in the right forearm; there was no tenderness. Condition was noted as improved, though after two weeks the patient required catheterization.

On February 10 a neurological consultation was requested. At this time the patient presented a well-marked chorea, generalized and involving practically the whole skeletal system, including speech and respiration. He was out of bed; fairly alert; no temperature; visual apparatus and cranial nerves satisfactory, no other evidence of sensory motor involvement. On February 14 one stool examined reported paratyphoid-B, with agglutination 1 to 2000, but subsequent examinations failed to confirm this.

History from the Patient. No family or previous history of any nervous or mental disease. Personal: No rheumatism, tonsillitis, cardiac or dental affection; no history of any other acute infectious or venereal disease. Present trouble began gradually a few days before admission here, with headaches, weakness, lassitude and pain in the right arm. Claims that memory is hazy for the first week of his illness.

Further residence in the hospital did not show any change in his choreic picture, and when examined on April 18 he still presented a well-marked, generalized chorea; right upper extremity more involved than the others. Cardiac examination did not elicit any murmurs; teeth in good condition. Spinal fluid and blood examination completely negative.

Here we are dealing with a definite picture of chorea, presenting neither hereditary nor constitutionally predisposing factors, the onset of which was fairly abrupt, during convalescence from an acute febrile disorder, the nature of which was not definitely

established, and presenting mainly a lethargic state, with meningeal involvement. The question of typhoid as an infective basis is naturally to be considered, but both the clinical and laboratory findings fail to substantiate. The Sydenham (infective) type of choreas generally show an early improvement after proper treatment, but in this instance three months have elapsed and there has been no abatement of the choreic movements. Neal[11] has recently reported instances presenting meningeal symptoms, with tremors occurring during convalescence from attacks, clinically influenza. In this case the influenza was apparently not considered during the febrile period, so that the etiological basis still remains in question.

CASE V.—Z. J., aged twenty-three years. Pvt., 302 Eng., Co. A. Admitted to B. H. 90, January 30, 1919, with diagnosis of N. Y. D. and reclassification; no further information.

History. No family or previous personal history of any nervous trouble, except deafness, of sudden onset, September 6, 1918, following close proximity to shell explosion; there was also ringing in the left ear, both disappearing after a month. Present illness: Sudden onset four days before admission; severe headaches; dizziness; vomiting and fall; was unconscious for about twenty-four hours. When he regained consciousness, continued to be dizzy and unsteady on his feet. Was very dull mentally and had continuous headaches; noticed a change in his speech—knowing what to say, but finding difficulty in expressing himself. Claims that his speech has continued so up to date.

Examination on Admission. At first he appeared dull and retarded, and remained in bed by choice; but when examined his appearance was more of bewilderment; sensorium, however, was not clouded. Conjunctiva and sclera were injected, but patient did not complain of being ill, nor was there any temperature. Head presented fine rhythmical tremors and there was inability to concentrate eyes upon any object, but no nystagmus. Fundi and pupils were normal; no extra-ocular limitations. Speech somewhat dysarthric, with a nasal quality. Audition good and equal. Labyrinths reported normal by the otologists. On bending head forward and backward he became dizzy. Voluntary motor power good and equal in all extremities. Deep reflexes increased; no Babinski or clonus; abdominals active and equal; sphincters intact; sensation unimpaired; gait very unsteady, requiring assistance. Marked finger to nose and hand to knee ataxia on the left; postural and deep sensibility otherwise unimpaired. Heart showed no evidence of endocarditis; blood-pressure normal. White blood cells, 8500; 2 per cent. eosinophiles; spinal fluid, 5 cells; trace of globulin; Wassermann blood and spinal fluid negative.

[11] Loc. cit.

Clinical Course. A month after admission, disturbance of equilibrium became more marked and practically limited to the left. On holding upper extremities forward and extended, coarse, irregular movements were noted in the whole of both limbs, but more pronounced in the left. With finger to nose test on the left there was a wild intention tremor, resembling those frequently seen in advanced cases of multiple sclerosis; he swayed in the Romberg position, with a tendency to fall toward the left. Knee-jerks on the left side greater than the right side; exhaustible patellar clonus on the left. On March 26, he still complained of dizziness, ringing in the ears, unsteadiness in gait; no gastric disturbance. Intention tremor in the left upper extremity was more marked than noted on former occasions, also adiodokokinesia; no hypotonicity.

In this case we are dealing with a cerebellar disease picture, the onset being very sudden, with unconsciousness for twenty-four hours, then dulness and continued headaches for three weeks. There was conjunctival injection, but the temperature was normal and no other evidence of an acute infection. There are several possibilities that suggest themselves, *e. g.*, sudden occlusion of the left inferior cerebellar artery, multiple sclerosis, cerebellar neoplasm and a functional condition. Endocarditis and syphilis were ruled out. Aside from the tendency to progression of the left-sided cerebellar symptoms, there was no indication of increased intracranial pressure or neoplasm, and the pronounced intention tremor and uncertain speech were the only signs pointing to multiple sclerosis. Frequent examinations convinced one that the disease was real. There then remains the question of the pathology and the etiological factor. Just what relation the concussion, followed by left-sided deafness four months previously, bears to his present condition remains unclear, as there was a period of three months intervening when he was free from any symptoms. There being no history accompanying the patient, one cannot rule out definitely a preceding acute infection. Some of the observers who had seen this case felt inclined to group it with those of lethargic encephalitis.

Case VI.—C. A., aged twenty-three years. Pvt., Bat. B., 314 F. A. Admitted to B. H. 90, February 14, 1919, with a diagnosis of rheumatism and mental observation.

History (from patient). No family or previous personal history of any nervous or mental disorder. On February 1 there was an abrupt onset of pain in the left upper and lower limbs, with fever, but no swelling of the joints. A week later he was unable to shut the left eye properly, and at the same time he had urgency of urination, and was often unable to start a stream for as long as ten minutes.

Examination on Admission. Dull and inactive; preferred his bed; temperature normal. Complained of headaches, dizziness,

urgency, and difficulty with starting urinary stream. Pupils small, equal and regular; reaction to light somewhat sluggish, but not limited; accommodation good. No extra-ocular palsies, but definite lateral and inexhaustible nystagmus in both directions. Complete left facial palsy; tongue protrudes in the midline; speech measured and of increased nasal quality. Motor power good and equal in both upper extremities; no evidence of arthritis. Deep reflexes exaggerated; pseudo-Babinski on the right; no ankle-clonus. Abdominals not elicited on repeated examinations (level abdominal wall); cremasters present. Sensation and deep sensibility unimpaired. Spinal fluid 71, cells; lymphocytes; globulin increased; Wassermann in blood and spinal fluid negative.

Clinical Course. During further residence, facial palsy gradually disappeared; nystagmus became more jerky and exhaustible; fundi normal; no pallor of disks; speech unchanged. He developed a mild intention tremor in both upper extremities. Abdominals remained absent; reflexes otherwise unchanged; still complained of urgent and tardy urination. On March 25 there was a faint showing of the left abdominal reflexes; mentality clear.

Here was a picture of disseminated sclerosis of abrupt onset, with an early febrile period and a dull, inactive mental state. There was pain in the extremity suggesting "rheumatism" and a pleocytosis in the spinal fluid (71 lymphocytes), with no temperature or other signs of meningeal involvement. The facial palsy was fairly transient and the mental state had cleared up, but when discharged to the States, six weeks after admission, there was sufficient evidence to classify him as multiple sclerosis. Was this disease picture independent or associated with lethargic encephalitis?

Case VII.—F. D. R., aged twenty-four years. Pvt., Troop A, Hdq. Bn., 1st Army. Admitted to B. H. 90, February 8, 1919.

History (from patient). A week prior to admission, while on an extensive motor trip, with exposure and insufficient sleep, he felt chilly, feverish and drowsy for the greater part of that week. He noticed marked blurring of vision; eyes pained him; had frontal headaches and became nervous. There was no vomiting; disturbance with gait or sphincter control.

Examination on Admission. Drowsy, but sensorium was not definitely clouded; temperature, 101°; complained of blurred vision and headaches. He displayed fine tremors of the head, with a tendency of the latter to incline to the right. There was a definite right facial palsy involving all three branches; also diminished audition and bone-conduction on the right; no earache or evidence of otitis media. Pupils markedly dilated, but reacted well; fundi normal. No extra-ocular limitations or nystagmus. Tongue protruded in the midline. No rigidity of the neck or Kernig. Motor power in the extremities unimpaired; deep reflexes increased; abdominals present; no Babinski or clonus. Sensation unimpaired;

mild finger to nose ataxia on the right. Lumbar puncture in recumbent posture; fluid under high pressure; clear; 14 cells; lymphocytes; trace of globulin; marked sugar reduction; culture negative; Wassermann blood and spinal fluid negative.

Clinical Course. Temperature continued for a few days; headaches subsided; right facial palsy began to diminish after a few weeks' residence. Vision improved; tremors of the head only occasional. After a few weeks he was discharged to the States.

This case might be considered one of ordinary Bell's palsy (chill variety) were it not for the acute infection, with the symptoms and signs of encephalitis and lethargy. The diminished auditory acuity and bone-conduction suggest cochlear involvement. There was a mild lymphocytic pleocytosis in the spinal fluid.

CASE VIII.—D. J., aged twenty-seven years. Pvt., 307 Inf., Co. E. Admitted to B. H. 90, G. U. service, March 6, 1919, with a diagnosis of cerebrospinal syphilis.

History (from C. H. No. 9, this information accompanying the patient is the best forwarded by any of the camp hospitals). Onset five days before admission, with blurring of vision and seeing double; no other complaints; denied history of lues or gonorrhea. Continued notes: Mentality unclear; eyes and conjunctivæ injected; diplopia with upward nystagmus; tongue coated; edges smooth. Heart and lungs negative; spleen slightly palpable; reflexes normal. White blood cells, 9000; culture of blood, urine and feces negative. On February 11 he required catheterization; no effort made to urinate. Mentality becoming more clouded; temperature, 99°; pulse, 74; respiration, 20. Owing to blood Wassermann, which was reported at first as anticomplimentary and a week later as one plus he was given salvarsan on February 22 and again on March 3. On March 5 condition noted as improving; pupils reacted slowly to light, also paralysis of right face.

Examination on Admission (B. H. 90). Patient appeared very dull, stupid and drowsy; though there was no actual disturbance of motor speech, he had little to say. He stated, however, that the onset of illness was gradual, extending over a week before going to the hospital. He remembers very little of the early part of his illness, except of being quite sick with fever, and that he was being bathed in bed. He now complained of blurred vision, general weakness and sleepiness; "head feeling wrong" and occasional "shaking of hands." Left ptosis; left divergence strabismus; diplopia, with or without red glasses. Pupils medium-sized, equal; left very sluggish and limited to direct light; both pupils showed very faint reaction to accommodation. Paresis of left rectus and both superior recti on conjugate movements; both internal recti failed completely on convergence; all individual extra-ocular movements slow and somewhat limited. Fundi normal. Partial paralysis of right face, lower two-thirds. Facial expression blank;

unable to smile or be stimulated. Voice monotonous and restricted. Tremors of eyelids and tongue. All voluntary movements slow and deliberate, but no actual paralysis of any muscle groups. Gait somewhat unsteady and awkward. Reflexes, superficial and deep, were normal; no temperature. White blood cells, 4050; 1 per cent. eosinophiles; spinal fluid, 8 cells; marked increase in globulin; Boveri's color test positive; blood and spinal fluid negative.

Clinical Course. During further residence in the hospital he brightened up somewhat; partly successful in attempt to smile, and took some interest in ward activities, but otherwise no change.

Case IX.—H. J. E., aged twenty-six years. Corp., 324 Inf., Co. E. Admitted to B. H. 90, March 5, for refraction (from C. H. 64, no further information).

History (from patient). A month ago he had fever for a few days; was sent to the hospital, where he was told he had the mumps. A few days after the onset he experienced blurring of vision, diplopia and became very nervous; no headaches or vomiting. For two weeks he was unable to move tongue, so that he could not place food properly; also had swallowing difficulty and trouble with starting urinary stream. Claimed to remember all that happened during his illness.

Examination on Admission. Appeared dull, stupid and extremely deliberate in all his movements. Coöperation was uncertain, but there was no actual confusion. Complained of blurred vision, yawning and of feeling sleepy during the day. He stated that he was aware of a decided change in his speech, *e. g.*, difficulty, with full expression and occasional stammering. Pupils very dilated, the right larger than the left; both regular; reaction to both light and accommodation practically *nil*. Eyegrounds normal. Partial ptosis and divergent strabismus on the left. All conjugate movements slow and at times difficult to elicit, except upon repeated effort; no nystagmus. Speech slow, measured, monotonous and occasionally stammering. Mastication and swallowing good. Slight facial weakness on the left, tremors of lips and tongue. Motor power in extremities slow, but otherwise unimpaired. Deep reflexes absent in the upper and equally diminished in the lower extremities; superficial reflexes normal. There was no temperature; he did not complain of being ill. White blood cells, 8750; polynuclears, 75 per cent.; eosinophiles, 3 per cent. Spinal fluid, moderate pressure, fluid clear, 27 cells; mononuclears predominating; marked increase in globulin; Boveri's color test positive; Wassermann in blood and spinal fluid negative.

Clinical Course. Three weeks after admission practically little change, face becoming more dull and fixed; claimed that he was unable to laugh. Instead of being inactive, as on admission, he was now noted as restless, pacing up and down the wards, making

frequent approaches to ward surgeon and nurses, with anxious queries as to his progress and disposition. Complained of difficulty, with complete understanding of spoken language; but upon examination his orientation and his memory are good and he handles figures readily. Vision blurred; reading difficult; pupils still dilated; right, 5 mm.; left, 4½ mm.; right reacted slightly to light but not to accommodation; left rigid. Left ptosis (partial) and left divergent strabismus of 170 degrees. All extrinsic eye movements weak and limited, but improve with repeated effort. Mild paresis of left facial muscles, including those of the forehead. Gait somewhat unsteady; mild finger to nose ataxia on the right with evident awkwardness in saluting. Occasional fine static tremors in both thigh and leg muscles.

CASE X.—E. W., aged thirty years. Pvt., 305 Fld. Sig. Bn., Co. C. Admitted to B. H. 90, February 19, 1919, first to medical, then the eye and later neurological department.

History (from C. H. 49). Admitted there January 6, 1919, with diagnosis of acute otitis media (right). Complained of diplopia to the right. On January 10, right mastoid operation performed; on January 13 developed bronchopneumonia; temperature for nine days. It was noted that he had rotatory nystagmus on the right.

Examination on Admission. Dull, painful expression; forehead corrugated; complained of headaches; double vision to the right; dizziness with a tendency to fall to the right and forward. Claimed that during his pneumonia he was "out of his head" for about two weeks. Eye-grounds and pupils normal; right external rectus palsy and pain in the right eye on lateral excursion to the right; no other cranial nerves affected. Skeletal system, motor power, deep and superficial reflexes normal. Gait slow and uncertain; swayed in the Romberg position and fell forward after doing an about-face. Slight ataxia in both upper extremities; more on the left. Normal temperature, white blood cells, 10,250; polynuclears, 70 per cent.; eosinophiles, 2 per cent.; spinal fluid cell count, 3; globulin, trace; sugar, negative; Boveri's color, negative; Wassermann blood and spinal fluid negative. Following removal of small amount of spinal fluid, he had pronounced puncture headaches and prostration for a week; this was unusual in the other cases. During further residence his right external rectus palsy gradually cleared up and the patient brightened up in general.

In the three cases just cited we have fairly typical examples of what has been described as lethargic encephalitis, all three being ophthalmoplegic and the first two associated with facial involvement. The most striking feature on casual observation was their lethargy, as noted in facial expression and psychomotor retardation. The course was vacillating, so that on repeated effort they were able to make a presentable appearance before a camera

and aside from strabismus a photograph failed, in the main, to bring out the expressionless features which were generally detected from a distance. All three cases were of abrupt onset, preceded or associated with a febrile clinical picture, and only the first, *e. g.*, Case VIII, could be considered as absolutely independent of a more specific infection, while the others, Case IX, complicated mumps and Case X a mastoid, with bronchopneumonia. A lymphocytic spinal fluid was definitely present in only one instance, that complicating mumps. Up to date the lethargy has been gradually disappearing, but the ophthalmoplegic and facioplegic signs in the first two cases have shown little tendency toward recovery.

Discussion. The main symptomatology and clinical course of lethargic encephalitis have been well presented in recent editorials and special articles, particularly by the *Journal of the American Medical Association*, February 8, 1919, and March 15, 1919. MacNalty, in his contribution to the British report, recognizes seven types, as follows: "Clinical affection of (*a*) the third pair of cranial nerves; (*b*) the brain-stem and bulb; (*c*) the long tracts; (*d*) the ataxic type; (*e*) affection of the cerebral cortex; (*f*) cases with evidence of spinal cord involvement; (*g*) the polyneuritic type with affection of the peripheral nerves."

In reviewing the 10 cases just cited, we find that the above classification may be extended so as to include some of the special systems, *e. g.*, the thalamic, the pallidal and the striorubral. The sympathetic system is probably also involved as noted in Case II. With regard to the last, the polyneuritic type, the writer deems it advisable to consider those separately until the investigation of acute infectious polyneuritis has received wider consideration. A number of these cases have been under observation here within the last few months and will be considered in another communication.

Conclusion. It is well to review briefly the present status of this new disease. Encephalitis may occur as a complication in any acute infection. With encephalitis, an elastic term, diffuse brain involvement is expected, and with it the naturally outstanding feature of lethargy. In 9 out of 10 cases described here there was a definite febrile period, either preceding or concomitant, including "bad cold," mumps, some form of bronchopneumonia, and in one a possible paratyphoid-B. The facilities here were such as to afford only a clinical and a rather limited laboratory study of these cases. There was an eosinophilia in the blood and a lymphocytic spinal fluid in most instances, and what bacteriological examinations were made proved negative. This much is true, that while the majority of these cases resembled other well-known diseases of the central nervous system, they were atypical in some form, either in onset, clinical course or outcome; but clinically they were encephalitis with lethargy. The study, therefore of

these cases, while bearing in mind the possibility of their being distinct infectious diseases of the nervous system, which may escape detection because of a general similarity in their clinical manifestations to well-recognized entities does not aid in establishing lethargic encephalitis as a definite clinical entity.

THE SIGNIFICANCE OF CERTAIN PULMONARY LESIONS IN RELATION TO THE ETIOLOGY OF INFLUENZA.

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The great variations in the results of bacteriological analyses of the lungs and respiratory tract of those dead of influenza have left no common ground for agreement upon any one microörganism as the etiological agent of this disease. Although in certain sections of the country evidence seemed to be strongly in favor of Pfeiffer's bacillus,[1] the failure to find this microörganism and the predominance of other invading bacteria in different localities have served in large measure to counteract what early seemed to be a confirmation of Pfeiffer's view of the importance of this bacillus in etiological relation to influenza. Nor have the carefully planned and skilfully executed experiments upon human beings in this country, designed to transmit the disease under controlled conditions, lessened our ignorance of a specific causative agent or its mode of transmission, though these experiments were carried out on a large scale and under what appeared to be perfectly adequate conditions.[2] There remains the pathological anatomy of the disease as a possible and perhaps lone source at the present time of some positive knowledge concerning its doubtful cause.

In the absence of bacteriological evidence for a specific etiological agent, the pathologist is confronted with the question whether there are lesions which are typical of the disease, so that one perceiving them may be assured they are the result of influenza *per se*. If this can be satisfactorily established then we have a criterion upon which to evalue the importance and relationship of demonstrable associated infectious agents and may arrive at a tentative conclusion regarding the etiology of the disease. In the absence of such a criterion we shall probably remain, despite the overwhelming losses of the recent pandemic and our abundant opportunity for investigation, in a lack of knowledge respecting it equal to that following the last pandemic of 1889.

[1] Keegan, J. J.: Jour. Am. Med. Assn., lxxi, 1051.
[2] Public Health Reports, January 10, 1919, xxxiii, 34.

The prevailing opinion is, as Wolbach[3] has stated, that death from influenza means death from lung complication—pneumonia in some form—and it is in the lungs that possible characteristic lesions may be found. In 1889 Leichtenstern[4] expressed his conviction from clinical and anatomical evidences that there existed a primary pneumonia produced by the poison of influenza, and from a study of the material which I have had available from the height of the epidemic last fall and subsequently I am convinced that this is true and that the etiological factor is not any one of the numerous pathogenic microörganisms which have been cultivated from the lungs, often in pure culture, but an unknown virus which produces the general intoxication and may produce characteristic lesions in the lungs with or without the coincidence of other infectious agents.

That influenza is due to an unknown agent is a view held by a considerable number of those who have studied the disease from various points of view, but I do not find the impression of specific lesions in the lung prevalent, partially no doubt because most of our reports of the pathology of the recent epidemic have consisted of gross descriptions; and while the evidence for this opinion is not altogether above criticism, I feel that it is strong and well worthy of great emphasis.

The pulmonary lesion to which I would especially refer is a dilated condition of alveolar ducts, with a hyaline membrane partially or completely covering their walls and sometimes those of subtended alveoli. This lesion has been described already by MacCallum,[5] Wolbach[6] and by Burnett and the writer.[7] The membrane is not present within all dilated air spaces and is not uniformly distributed throughout the lung. It may be most conspicuous in areas of the lung which contain least exudate. It is present most conspicuously in acute pneumonia of short duration accompanying influenza. The membrane is irregular in thickness, sometimes stratified, with occasional cells within narrow clefts. It is usually thickest over the angles of the wall, but may completely fill an alveolus. At its margins it may be continuous with strands of fibrin, though it does not give the staining reactions for fibrin. In some preparations it appears to be composed almost entirely of fused necrotic mononuclear cells, in others of coalescing strands of fibrin, and probably always represents a mixture of the two. Associated with this lesion are evidences of injury and acute reaction, such as hemorrhage, edema, cellular and fluid exudate and focal necrosis of alveolar walls, each of which varies in extent in

[3] Johns Hopkins Hospital Bulletin, vol. xxx, 338, 104.
[4] Specielle Path. u. Ther., Nothnagel, iv, No. 1, p. 83.
[5] Jour. Am. Med. Assn., lxxii, 10, 720. [6] Loc. cit.
[7] Goodpasture, E. W., and Burnett, F. L.: U. S. Naval Medical Bulletin, xiii, 2, 177.

different cases. The hyaline membrane is always associated with dilated alveolar ducts. This lesion is not to be considered specific in the sense that it contains specific elements in its composition, for so far as has been demonstrated it represents a reaction to injury by elements normally participating in inflammatory processes. The evidence for its specificity depends solely upon the constancy of its association with influenza and its absence in other types of pulmonary inflammation known to be of a different nature. So far as I am aware it has not been described in any inflammation of the lungs other than that accompanying influenza. Wolbach describes it as constantly present in the cases of influenzal pneumonia studied by him, and considers its presence "the one distinctive feature in the pathology of influenzal pneumonias, and its constant occurrence indicative of the entity of the initial lung infection." I found it present in all of the cases of influenzal pneumonia which died within a few days after the onset, and in 70 per cent. of the total number of pneumonias accompanying influenza examined during the height of the epidemic. Failure to find it only occurred in cases of outspoken secondary lobar pneumonia and streptococcus infections with extensive necrosis of the pulmonary tissue. MacCallum describes the same lesion as an accompaniment of certain more acute pneumonias following influenza, which he considers due to pneumococci. He does not record the frequency of its occurrence, but since he recovered in the great majority of his cases, pneumococci in pure culture or predominantly, presumably he found it often.

While this lesion is thus seen to have been demonstrated with great frequency in cases dying with pulmonary lesions accompanying influenza during the height of the epidemic, and though it is probably not present in association with any other disease, its presence is, nevertheless, not dependent upon any one demonstrable microorganism, for in the cases studied by Wolbach at Camp Devens, Ayer, Mass., and at Boston, and in those observed by me at the U. S. Naval Hospital, Chelsea, Mass., it was more commonly associated with Pfeiffer's bacillus, often in pure culture; and in the three groups of cases investigated by MacCallum at Camp Lee, Camp Dix and at the Johns Hopkins Hospital, it was accompanied by infection with pneumococci in pure culture or predominantly. Since my former report[8] I have encountered the same lesion in three individuals dying from clinically typical influenzal pneumonia, from the lungs of whom hemolytic streptococci were grown in pure culture, and from two others in whose lungs no microörganisms could be demonstrated either by cultural methods, animal inoculation or microscopic examination of the tissues.

From this evidence it may safely be stated that the lesion characterized by a hyaline membrane as described, situated upon the

[8] Loc. cit.

walls of dilated alveolar ducts and adjacent alveoli, is not a reaction typical of the presence of any one of the various demonstrated microörganisms with which it may be associated; and it may be present in the lungs of persons dead of influenza, in which no microorganisms are demonstrable by the ordinary methods.

Two explanations for its presence occur to me. First, that it represents an inflammatory reaction which under circumstances of lowered resistance, such as occur with influenza, may be brought about by any pathogenic microörganism or toxic agent that may gain entrance to the lungs. Even if this explanation should prove to be the true one the lesion itself is no less specific, for it is the circumstance of an attending influenza that lays the conditions for its formation. The explanation, however, does not appear to be a good one for the reason that we do not find the membrane present in pulmonary inflammations due to pneumococci, streptococci or influenza bacilli unassociated with epidemic influenza. Furthermore, none of these microörganisms or other demonstrable bacteria are associated in any intimate way with the lesion; in fact, whatever the attending infection, this membrane is usually bacteria-free, and, as will be described later, it may be present without demonstrable associated infection. I have gained the impression that it is formed before the fluid and cellular exudate predominates in the inflammatory process, for it is sometimes found most abundantly at the margin of the more firmly consolidated regions and may be less in evidence where the fluid and cellular elements are most conspicuous.

The second explanation is that it represents an inflammatory reaction to an unknown causative agent of influenza which injures the walls of alveolar ducts at first in a relatively mild degree, causing desquamation and necrosis of epithelial cells and an exudate of large mononuclear cells with some fibrin and serous fluid, all of which become partially concentrated by the inflowing and outflowing respiratory currents of air until they coalesce and adhere to the injured walls. The more extensive injury and reaction, with focal necrosis, hemorrhage and fluid exudate, occur later with the increase in the intoxicating agent and with additional injury brought about by secondary infection of any kind.

Supporting this view it seems to me are the facts that this lesion, so far as we know, occurs only in the inflamed lung of those infected with influenza, the diagnosis of influenza being based upon the pandemic character and extreme infectiousness of a disease of certain clinical manifestations; that it is not exclusively associated with any one microörganism, and the microörganisms with which it may be associated do not produce it in inflammations of the lungs other than those accompanying influenza; that it may be present in typical form in lungs in which no organisms are demonstrable by ordinary methods; and, finally, of those dying of pulmonary

lesions accompanying influenza it is demonstrable in a large proportion of cases.

In emphasizing the importance and apparent specificity of the hyaline membrane upon the walls of dilated alveolar ducts, I do not intend to imply that this is the only lesion produced by the virus of influenza within the lungs; in fact, I would attribute in large part to the action of influenzal virus, *per se*, the extensive injury to the pulmonary tissues with resulting hemorrhage, necrosis and acute exudate in cases dying shortly after pneumonia became manifest, and in the lungs of which few or no microörganisms are demonstrable within the alveolar tissues. Yet it is obviously impossible to determine what degree of this injury might be due to the action of secondary invading microörganisms if they are present, for such injury and inflammation is of a general kind to which any one of the infectious agents might contribute in any degree.

The above-described lesion, then, in man, I believe, may be considered as peculiar to the pulmonary inflammation of influenza, and none of the microörganisms demonstrated in the lungs is essential to its production. These propositions carry the inference that it is a reaction to a specific agent or set of conditions which are present only in this disease. To establish its complete independence of the microörganisms which have been demonstrated in the lungs, we should hope to find it present in certain instances of influenzal pneumonia in which demonstrable microörganisms are not found. At the U. S. Naval Hospital, Chelsea, Mass., we had the opportunity to study two such cases, though I have not found similar instances recorded elsewhere. The prime significance of these observations makes it important that they be described here. The hyaline membrane was present in typical form in each of these lungs, though no microörganisms have been demonstrated in them by culture, animal inoculation or patient study of strained smears and sections by methods which, in other cases with positive cultures, have easily revealed the type of microörganism grown from the lung.

The first instance was that of a large, robust young man who contracted influenza during the height of the epidemic in September, 1918. Clinically, he presented the usual evidences of the disease, and on the fifth day after the onset signs of consolidation in the lungs were first detected. These rapidly spread, intoxication increased and he died on the seventh day after his initial symptoms. Postmortem examination was made two hours after death. Grossly the lungs presented the usual edematous, hemorrhagic, emphysematous condition constantly found in the very acute cases. Cultures were made from both lungs by sterilizing the pleural surface and inserting deeply a capillary pipette withdrawing from various portions a few drops of fluid exudate. This was planted upon whole blood-agar plates, such as had been used successfully in previous cases and which had been properly tested. All of these cultures

proved sterile as well as cultures from the heart's blood. Smears from various portions of exudate, stained with Loeffler's methylene-blue and other routine stains, were likewise negative for micro-organisms. Thin paraffin sections from various regions of the lung were fixed in Zenker's fluid and stained with eosin and methylene-blue, Gram-Weigert and by the anilin-carbol-fuchsin method devised by me to demonstrate Pfeiffer's bacillus in tissues.[9] No organisms were found excepting a few intracellular Gram-positive cocci within the bronchial exudate.

Microscopically the lungs showed an extreme degree of injury and destruction of alveolar walls with hemorrhage, edema, a little fibrin and scant cellular exudate. The alveolar ducts were dilated and on the walls of some of them was found the typical hyaline membrane.

The second case was a more unusual one, being the only instance of its kind observed by us, and I have not seen a similar one described.

The patient was a young man, aged eighteen years, who was admitted to the Naval Hospital with a typical attack of influenza. He was sick three days before admission. His illness continued during the last four days of September and first three days of October, 1918. His temperature was 103° F. on admission and fell the following day to normal. No clinical evidence of pneumonia was discovered during this attack. Three days later he was discharged from the hospital. Afterward he at no time felt well. He went home for a few days on furlough, then returned to his work as a hospital-corps man. His cough persisted; he lost weight and gradually became weaker until he had to report to the sick bay. From there he was sent again to the Naval Hospital, Chelsea. He reëntered this hospital November 6, 1918, with cough, pain in the chest, bloody sputum, anemia and signs of bronchopneumonia in the right lower lobe. His temperature on admission was 100.4° F.; pulse, 120; respiration, 28. He expectorated quantities of bright red blood. The pneumonia speedily became massive and spread to the left lung. The clinical records state he became septic, dyspneic and raised much bloody sputum. Serum from patients convalescing from pneumonia following influenza was administered without relief of symptoms. He died on November 9, three days after admission. White blood count on the day after admission was 17,600. Differential count: polymorphonuclear leukocytes, 58 per cent.; mononuclears, 40 per cent.; eosinophiles, 2 per cent. Urine showed a trace of albumin.

Postmortem examination made two hours after death revealed a pale, anemic, moderately emaciated body. There were 200 c.c. of clear fluid in right pleural cavity. The pleural surfaces were dark purple in color and for the most part smooth, though here and there

[9] MacCallum, W. G.: Jour. Am. Med. Assn., No. 10, lxxii, p. 720.

they were slightly thickened and covered by fine granules of fibrin. The right lung was completely consolidated and very firm. On section the cut surface was brick red in color and hemorrhagic fluid could be expressed and ran out of cut bronchi. Hemorrhage instead of edema was the predominant feature. In the left lower lobe patches of similar hemorrhagic consolidation were present. The lung gave the impression of having been injected with blood through the bronchi so that all the air spaces were filled. On closer inspection dilatation of terminal air channels was evident and the alveolar ducts were outlined by gray lines, and there were minute gray points everywhere as if many alveoli were filled with fibrin. Cultures taken from the various lobes, spleen and heart's blood were sterile; numerous smears showed no organisms. A guinea-pig inoculated intraperitoneally with ground lung died in forty-eight hours, but only a clear sterile peritoneal fluid was found, and its blood culture was sterile.

The spleen of this man was a little smaller than normal and quite pale, yellowish gray. On cut surface yellowish and gray opaque foci up to 2 mm. in size were evident. The kidneys were normal in size, but there were a few small hemorrhages in the cortex and moderate edema. Here and there in the wall of the small intestine were bright red hemorrhages measuring 1 or 2 mm. in diameter. The other organs presented nothing of special interest. The heart and valves appeared normal.

Microscopically sections of the lung show a tremendous amount of blood in the air spaces. Alveoli and terminal bronchioles are filled with erythrocytes. There are innumerable foci composed of polymorphonuclears, fibrin, large mononuclear cells and disintegrating hyaline material scattered through the sections. These foci often indicate small areas of necrosis of the alveolar walls. Here and there alveoli are filled with plugs of fibrin. In certain areas there is a great abundance of hyaline material upon the walls of dilated alveolar ducts and in alveoli. This appears to be formed largely of coalesced necrotic mononuclear cells with small amounts of fibrin. Its appearance and arrangement is in every way typical of that found in the lungs of more acute cases of pneumonia accompanying influenza. The inflammatory process in the lungs appears to be subacute, with a terminal exacerbation. In certain alveoli the exudate has undergone organization, and some bronchioles are filled with plugs of organizing exudate. Both larger and smaller bronchi appear normal. The epithelial coat is intact and no exudate excepting erythrocytes and some coagulated albumin, is present. Patient search has revealed no microörganisms whatsoever in this lung.

The spleen on section shows numerous foci of necrosis occupying especially the areas of former Malpighian bodies. Necrotic cells,

polymorphonuclears, strands and networks of fibrin compose these areas, situated about the small arteries.

The kidneys show a glomerular nephropathy with a fibrinous exudate in Bowman's capsule and cellular proliferation of glomerular tufts; some urinary tubules are filled with erythrocytes. Sections through the hemorrhagic points in the intestine show focal lesions in the wall of arterioles, with fibrinous exudate and a few polymorphonuclears. No microörganisms have been demonstrated in any of these lesions after repeated attempts.

While the presence of lesions in the kidney and spleen may be regarded as evidence that this case does not represent a pure influenzal infection, still the pathology of the lungs and the absence of demonstrable infectious agents to account for the acute pulmonary lesions seem to overbalance them in favor of influenza as at least the primary and predominant infection. And it does not seem inconceivable, although rare, that the virus of influenza might persist within the body for six weeks with the production of lesions of the character found in this man.

The clinical histories of these two cases leave little doubt that they are primarily instances of influenzal infection. Both contracted the disease during the height of the epidemic, and manifested typical clinical courses. The first died of his initial infection; the second, though combating successfully for a time his original attack, never quite recovered, and died of the disease a month later. Both presented lesions in the lung which are to be regarded as peculiar to the pulmonary inflammation of influenza, yet no microörganisms were demonstrated by the usual methods in the lungs of either. In the absence of any known infectious agent one is led to the conclusion that they represent instances of fatal influenzal pneumonia, caused by an infectious agent of which we are totally ignorant, and without secondary invasion of the lungs by any of the pathogenic bacteria commonly found associated with it. Granting that they are examples of influenzal pneumonia, the presence of the hyaline membrane on the walls of dilated alveolar ducts is further evidence of the specificity of this lesion and its independence of secondary invading organisms; or from analogy to other cases the presence of this membrane indicates that the pulmonary inflammation is that of influenza, though no bacteria are found. The pathology of the lungs in the second case is strongly suggestive of a persistence of the infecting agent in this tissue from the time of the initial attack one month previously, with a final and fatal exacerbation.

In interpreting these observations one feels justified in formulating the opinion that influenza is a distinct disease, recognizable clinically only by its epidemic proportions and extreme infectiousness, characterized pathologically by peculiar lesions in the lung, and caused by an unknown virus which gains entrance through the respiratory tract.

ROENTGENOLOGICAL DETERMINATION OF PULMONARY TUBERCULOSIS.

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A roentgenological study of several thousand chests at Camp Lewis, Washington, has prompted certain definite conclusions which are set forth in this article. In the neighborhood of 600* cases of tuberculosis were studied by the roentgen staff. In approximately 300 cases the clinical and physical findings were recorded, and in the small percentage in which laboratory findings were positive that fact was noted.

Lack of time did not always allow of the most careful clinical study, but a sufficient number of each type were studied to permit correlation of physical findings with roentgen observations. Certain definite presentations on both plate and screen were positively proved to be tuberculous by the finding of the bacillus to make the diagnosis by roentgen study alone fairly sure in all types and stages.

The study was made by screen, single plate, stereoscopic plates and by combination of plate and screen. The most perfect plate and the most brilliant screen are absolutely essential. It is sometimes necessary to make many plates of a chest in order to bring out the definite characteristics, using different degrees of penetration and different angles and position of exposure. Single or even double screen plates or films do not present the necessary brilliant contrast and detail. The Coolidge tube will not make a diagnostic chest plate and the gas tube must be used.

In plate interpretation, every shadow, configuration and position must be understood and carefully studied. The visibility of the bronchovesicular tree must be appreciated for height, age, weight and occupation. The differentiation between peribronchial infiltration and thickening must be understood. The exact difference of degree of illumination and radiability is very important.

Abnormal configuration of the heart silhouette suggests valvular disease, which might account for abnormal lung shadows. Circumscribed areas resembling calcification are seen distributed throughout, particularly the lower quadrants, the result of dilated vessels in mitral disease.

Position and configuration of the diaphragm conveys much infor-

*We wish to express thanks to Drs. R. D. McRae, J. M. Moore, W. C. Smallwood, T. G. Clement, and the members of the Tuberculosis Examining Board for their assistance and coöperation in our study of the cases.

mation. The degree of parenchymal involvement is determined by the diaphragmatic position in deep inspiration. Previous pneumonias often leave pleurodiaphragmatic adhesions.

The condition of the hilus is extremely important. Infiltration, calcification or exaggeration results both from pulmonary infection and from abdominal infection, and the differentiation must be made from the general and minute lung picture.

The location of calcification areas throughout the lung fields is very suggestive. Diffused distribution suggests healed disseminated tuberculosis. A few areas in the lower quadrants designate the location of the primary tubercle, while those in the upper quadrants are more significant of quiescent, inactive or chronic active tuberculosis. The configuration and radiability of calcification areas suggest the activity of the process. Dense areas, undoubtedly lime salts, that are not discrete and where borders are not clear cut but blend gradually with the surrounding lung tissue, particularly if the center presents a delicate mottling (suggesting that the interstitial tissue remains intact), indicates that the process is active and the caseation area has not completely become calcified.

There are many pathological conditions which involve the lower quadrants but very few which involve the upper quadrants. If abnormal shadows are found in the upper quadrants the first thought is tuberculosis, although the pneumonias and various other conditions (which do not present the typical tubercular shadows) must be differentiated. If abnormal shadows are seen in the lower quadrants a non-tuberculous process is suspected.

Conclusions with explanation of modifications follows:

1. The definite determination of pulmonary tuberculosis by means of roentgen study alone in particularly every stage is possible. The stage and the activity of the process ar not as definitely established by roentgen study alone as by physical examination alone, but a combination of both is decidedly more reliable that either alone.

2. The stage of an excavation is readily determined.

3. There are distinct roentgenological pathognomonic indications of pulmonary tuberculosis.

4. The exact involvement is more readily made out by roentgen study. Much assistance is furnished the clinician in regard to prognosis.

The value of thorough roentgen study of the chest in tuberculosis varies slightly in different stages and forms of the disease.

1. In the incipient stage the roentgen study is of undoubted value, definite haziness, peribronchial infiltration and a marked degree of lessened illumination upon coughing or deep inspiration being determined on plate and screen. These roentgen indications appear as soon as does the clinical evidence.

In the cortical type the clinical findings are exaggerated while the roentgen evidence is not pronounced, but in the peribronchial

and bronchopneumonic tuberculosis the findings are reversed. In these latter types there is apparently a hilus tuberculosis and the infection extends bronchogenetically, usually along the course of the vertebral, first intercostal and second intercostal bronchi. Apparently the primary tubercle originates as follows: The bacilli are carried deep into the distal bronchiole by inspired air. The thin wall of the bronchiole offers little resistance to the infection and caseation and destruction take place. After calcification these areas are readily seen and are, for the most part, located in the lower quadrants (because of greater expansion and consequently the entrance of more air). The infection then extends along the lymphatics to the hilus, and if not arrested there proceeds peribronchogenetically to the apices, producing a peribronchial involvement in its incipiency. In practically every case of chronic tuberculosis the path of travel from the lower quadrants to the hilus and thence to the upper quadrant can be made out on the plate. Many chests have been observed in healthy subjects, in which the primary tubercle and the hilus calcification can be seen. Often the bronchi along which the lymphatic infection travels will show numerous small calcification areas, and a beaded appearance is presented. If the primary infection is in the abdomen no primary tubercle is found, but distinct hilus infiltration or calcification is observed. In massive hilus tuberculosis the infection must of necessity reach the bronchial glands by one of these two routes.

2. After fibrous infiltration takes place the roentgen indications are almost pathognomonic, particularly for the disease, but also for activity to a slightly lesser degree. Even before mediastinal retraction appears the evidence of fibrosis is apparent because of the extensive bronchovesicular thickening, the delicate strand-like shadows and the further decrease in radiability. After organization of the fibrous process, with more or less retraction and the appearance of compensatory emphysema, the diagnosis is more readily reached; but activity is less easily determined. At this stage the process is very liable to become quiescent. The physical findings are then very indefinite indeed.

3. The caseation areas are not definitely made out, but after calcification takes place, whether with marked or little fibrosis, the diagnosis is definite for tuberculosis and the degree of activity is suspected.

4. In the ulcerative type the excavations are classed as acute, subacute chronic and healed, and their age determined as follows:

(*a*) The acute cavity does not present a definite, distinct capsule; its configuration is not oval or circumscribed but more likely to be irregular; the radiability of its center is the same or less than the surrounding parenchymal shadows; it does not illuminate upon the patient coughing and there is no distinct drainage sinus leading toward the hilus.

(*b*) The subacute cavity begins to assume a definite circumscribed form; its capsule is readily seen, but is as yet not as definitely marked as in the chronic cavity; it usually contains a small quantity of fluid in its dependent portion, which indicates that drainage has not been perfected; above the fluid level the radiability is increased, indicating the presence of air. As yet the cavity does not illuminate upon coughing nor does the drainage sinus present as distinctly as later.

(*c*) The chronic cavity presents distinctly a fibrous capsule; it is oval or circular in shape, flat or spherical in configuration; it contains no fluid if the patient is examined late in the morning or in the afternoon; it illuminates brilliantly upon coughing and the thickened drainage sinus is readily made out.

(*d*) Healed cavities are not often seen; they present a very marked, thick capsule; contain no fluid; are very small in area and illuminate only slightly upon coughing. The drainage sinus is narrow, but its borders are very sharply outlined, indicating that no perisinus parenchymal involvement is present.

Differentiation between ulcerative excavations and the small emphysematous excavations must be made. These latter appear in the late fibrous stage and result from a constriction of the bronchioles from contraction of the fibrous tissue. The mechanics apparently is the same as in bronchiectasis, an increase of air pressure distal to the point of lumen-narrowing, which finally ruptures a terminal air sac and produces a small excavation. These excavations are multiple throughout the tuberculous area. No capsule is present; the outline is irregular; they illuminate upon coughing and contain no fluid in their uninfected stage. Clinically the isthmus is normal or widened; resonance is increased or normal; bronchovesicular breathing marked; harsh, prolonged expiration; and rales depending on the activity of the tubercular process. In all probability ulcerative cavities are often formed by infection of one or more of these emphysematous excavations. This has not been proved. In our experience only a small percentage of excavations were detected by physical examination even after being located by roentgen study. Probably the best indication of the existence of a cavity in the subacute and chronic stage, particularly after liquefaction of its contents, is a large amount of expectoration (2 to 4 ounces daily), in which the tubercle bacillus is demonstrated.

5. In the deep peribronchial type of tuberculosis, without parenchymal involvement, a distinct circumscribed peribronchial thickening will give way to an indication of peribronchial infiltration, and the bronchovesicular tree then presents a fuzzy rather than sharply delimited appearance. Extension of the process is then rapid, and there is an extreme lack of illumination on the plate, presenting a delicately mottled increase in density.

6. In massive hilus tuberculosis the roentgenologist is on a par with the clinician; its existence and activity can only be guessed.

Before calcification no definite indications are seen, either by screen or plate; after lime salt deposit, visualization of the area is obtained and quiescence suspected if the calcification is uniform in radiability and sharply demarcated, and *vice versa*.

7. In disseminated tuberculosis the lung picture presents nothing definite unless healing takes place, when many small areas of calcification are seen distributed throughout both lung fields, the greater number in the lower quadrants.

8. Probably all types of pulmonary tuberculosis can be classed, strictly speaking, as a true bronchopneumonia during a certain stage, but the roentgenological presentation of an acute tuberculous bronchopneumonia, in which the parenchymal involvement is peribronchial, superimposed upon a chronic fibrous process, is distinctive and typical. True, it is impossible by any means to differentiate the acute pneumonic process, especially if the tubercle bacillus is found in the sputum with an abundance of streptococcus, particularly the hemolytic type. Streptococcus infection of the lung parenchyma often involves the upper quadrants, both unilateral and bilateral, and is extremely difficult to distinguish from a tuberculous infection.

An old quiescent lesion which becomes active following measles, pneumonia, etc., is inclined to involve either both lungs in their entirety, the opposite lung only, especially in its lower quadrant, or the lower quadrant of the same lung in which the lesion is located.

PATHOGNOMONIC INDICATIONS. To the uninitiated there are two pathognomonic signs of pulmonary tuberculosis:

1. Lime-salt deposits in the upper quadrants, which do not necessarily indicate activity.

2. The cavity which indicates activity in the large percentage of cases.

Calcification areas, wherever located in the lung, in the vast majority of cases indicate that at some time there has been an active tuberculous process, but those of the lower quadrants are rather incidental, as healing usually takes place and the process stops at the bronchial glands. In the upper quadrants they indicate that the patient has a true, dangerous tuberculous infection which is either healed, quiescent or more or less active. If in addition there are indications of fibrosis, with no emphysema and little or no mediastinal or chest-wall retraction, activity is indicated. If clear, irregular emphysematous areas are interspersed, with more or less retraction, and the calcification areas are clear-cut and uniformly dense, the process is probably quiescent, chronic-inactive or healed. Differentiation from lues, the fungi infections and the pneumonias can be made without difficulty, but only after observing many cases.

Excavations are unmistakable if studied by both plates and screen. Activity is at once established, the differentiation from non-tuberculous lung abscesses presenting no very great difficulty. The

tuberculous cavities, except in a very small percentage, are found high in the upper quadrants and are often multiple or bilateral, while lung abscesses are practically always found in the body of a lobe and seldom multiple or bilateral. In our series 4 cases presented tuberculous excavations in the lower lobes. Three cases of multiple pulmonary abscesses were detected in a series of over 2000 cases of pneumonia studied by roentgen rays. These abscesses were either filled with broken-down, semisolid tissue or with pus, the patients not living sufficient time for but few of them to establish drainage or air to collect above the fluid level. Lung abscesses invariably in a few days present a collection of air above the fluid level. The same is true of tuberculous cavities, but the surrounding lung shows unmistakable evidence of peribronchial thickening, fibrosis and other signs of tuberculosis, depending upon the stage of the process. A non-tuberculous cavity tends to heal if adequate drainage is established, and is seldom seen when empty, while the tuberculous cavity does not as often completely heal and is usually empty.

Other conditions to a lesser degree pathognomonic are as follows: Fibrosis, retraction of the trachea, mediastinal contents, heart and chest wall, a decided lack of illumination of one or both upper quadrants on deep inspiration or coughing before the screen, and a lessened radiability, either uniform or delicately mottled on the plate; abnormal presentation in the upper quadrants if there is a hanging "dropped" or very small heart silhouette; or if the diaphragm on the corresponding side is in partial expiratory position or its excursion is impaired on deep inspiration. Any abnormality found in the upper quadrants should prompt the roentgenologist to suggest the probability of tuberculosis unless definite indications of another process are certain.

An interesting phenomenon seen in the more chronic emaciated cases is the difference in radiability of the pectoralis muscles, those on the affected side not being so dense and distinct.

In regard to the extent of the process and the prognosis much assistance is furnished the internist. Only a small percentage of cavities are diagnosed by the internist unless he be particularly adept. The size of the cavity and its stage can hardly be estimated without the roentgen rays. Chronic-inactive types present few physical signs, but the process in its fullest extent is visualized by both screen and plate. In the incipient stage, certain physical signs, rales and breath-sound changes are often more definite than the extent of the process would indicate.

The roentgen study is indispensable in treatment by artificial pneumothorax. Adhesions between the visceral and parietal pleura defeat the object, preventing compression of the diseased area. These adhesions will often be separated by more pressure. The roentgen study indicates when lung collapse goes on to lung compression and the amount of pressure necessary to separate the adhesions.

REVIEWS.

A Text-book of Biology. For Students in General, Medical and Technical Courses. By William M. Smallwood, M.D., Professor of Comparative Anatomy, Syracuse University. Third edition. Pp. 360; 235 illustrations and 8 plates in colors and monochrome. Philadelphia and New York: Lea & Febiger.

This is a modern college text-book, designed to supplement the laboratory courses in elementary zoölogy and botany. With the raising of entrance requirements to medical schools there have appeared books adapted to the new regulations. Perusal of this text will serve to give a good conception of what is being taught to the premedical student in general biology. Part I consists of information about the plants and animals studied in the laboratory, *e. g.*, paramecium, hydra, earthworm, clam, crayfish, bee and frog of the animal kingdom, and pleurococcus, yeast, algæ, fungi and trillium of the vegetable kingdom. Then follow chapters on such topics as biological factors in disease, evolution, variation and heredity, parasitism and symbiosis and animal behavior and its relation to the mind. In these are introduced many illustrative cases, which are of interest to the medical man and which should be important in molding the viewpoint of the student preparing to enter on the study of medicine. Thus under heredity is introduced the geneological tree of the Mampel family, showing the sex-linked character of hemophilia, while a diagram and photograph serve to show how sewage pollution of an oyster bed le directly to the participants at a banquet becoming the victims of typhoid fever. Although laboratory work is the ma'n method for the training of the student in the sciences, such a book as this must serve to stimulate his interest. W. H. F. A.

Applied Anatomy and Kinesiology. By Wilbur Pardon Bowen, M.S., Professor of Physical Education, Michigan State Normal School, Ypsilanti, Michigan. Second edition. Pp. 334; 197 illustrations. Philadelphia and New York: Lea & Febiger, 1919.

This volume is one of the Physical Education Series edited by R. Tait Mackenzie, Major, Royal Army Medical Corps, and pro-

fessor of physical education and physical therapy, University of Pennsylvania, Philadelphia. Kinesiology is the science of bodily movement and includes a study of the principal types of muscular exercise. Applied anatomy here has reference to the application of such study to the work done by muscles and the effect upon them of such work. Applied anatomy, without any associated and qualifying term, by custom, has come to be used in reference to the more general application of our knowledge of anatomy to the everyday practice of physicians and surgeons, especially to that of the surgeon. While the book is of interest to the average physician, it is probably of more interest to and intended for instructors in physical education. It involves a comparative study of the anatomy, physiology and mechanics of muscles as well as their pathology, therapeutics and hygiene. In undertaking this physical-education series the editor aims to place physical education on the plane that its importance and dignity demand. The general principles of muscular structure and action are considered, the effect of the muscles on the bones and the relation of the nervous system to the muscles. Each muscle in turn is studied individually as well as the various mass actions in the different parts of the body in relation to gymnastic exercises, games and sports, etc. The special knowledge here offered is of much service now in the treatment of the crippled limbs of our returned wounded soldiers. T. T. T.

MESS OFFICERS' MANUAL. PREPARED BY SEVERAL OFFICERS OF THE DIVISION OF FOOD AND NUTRITION OF THE MEDICAL DEPARTMENT, U. S. ARMY. Pp. 192; 3 illustrations. Philadelphia and New York: Lea & Febiger, 1919.

A MANUAL which presents a myriad of facts concerning all phases of mess management in logical order, it is a book which would be of assistance in managing the messing of any number of people. However, this is not a book which can be handed to an untrained individual, for the use of terms dealing with physiological chemistry involves an otherwise simplified presentation of a great need which this book fulfils. W. B.

DE L' ORTHOPÉDIE INSTRUMENTALE. By DR. GABRIEL BIDOU. Pp. 132; 20 figures. Paris (no publisher's name), 1919.

THIS little book treats in an elementary way of prosthetic appliances for cripples, paralytics, stiff joints, etc. It comes furnished, with a ready-made "review," on the stationery of the "Orphan-Apprentice School," 40 rue La Fontaine, Paris; the author's card

is attached, with the manuscript notation that he will be grateful for the publication of this "vient de paraitre."

The author discusses at some length the mechanics of locomotion, and while this portion of his work is of interest, there is little that is new suggested either in theory or practice. He employs an apparatus with a shoulder strap to flex the impotent thigh upon the trunk, and for artificial limbs prefers the use of celluloid sockets, with cords to manipulate the joints by leverage over pulleys of different diameters. It may be said that the apparatus usually employed in this country is simpler in construction and equally efficient. A. P. C. A.

MILK. By PAUL E. HEINEMAN, Ph.D., Director of the Laboratories of the United States Standard Serum Company. Pp. 684; 172 illustrations; Philadelphia and London: W. B. Saunders Company, 1919.

THIS book is a rather important addition to medical literature. As far as the knowledge of the reviewer goes it is unique in that it is the only volume devoted entirely to the subject of milk. It is undoubtedly of importance that milk should be carefully considered, and it behooves the medical profession to be possessed of complete understanding of what is and what is not sufficiently good milk for human use. In order to appreciate this question, milk must be followed from the time of its production to its consumption, and in Dr. Heineman's book we find such consideration.

In the first chapter is an interesting historical review of milk and milk products. Butter was used at least as early as 2000 B.C., and the churn has been a constant companion of man throughout his forward struggle. All that is known about the physiology of lactation will be found in a chapter on that subject. The space does not allow a critical analysis of the pages devoted to the physical properties of milk, the physical and chemical examination and the general chemistry, suffice it to say that they are unusually complete.

While adulterations and preservatives are no longer commonly used, they are not forgotten, and their detection by means of tests is outlined. Enzymes in milk and the transmission of toxins through milk occupy two short chapters. Very important is that section of the book devoted to the microörganisms in milk. Here the whole subject of the care of milk enters in. The cow, the dairy, the method of milking, the shipping and numerous other phases of getting clean milk and keeping it clean are studied. The illustrations are plentiful and good in this connection. Milk-borne infections are of enough importance to demand a long chapter. A chapter on pasteurized milk follows immediately after one on certified milk. The reviewer suggests that certified milk, while undoubtedly the

best milk to use, should not always be used unpasteurized. This is especially true in the summer when there is any question of delayed or imperfect transportation. Then milk should be pasteurized even though produced under ideal circumstances.

An all-too-short chapter is included on milk in relation to infant-feeding. This is ably written by Drs. Abt and Levinson. The author does not forget the milk products, butter and cheese, and accords them each a chapter. One also finds several other subjects considered, such as ice-cream and ices, condensed milk and milk from mammals other than the cow. A. G. M.

PROBLEMS OF FERTILIZATION. By FRANK RATTRAY LILLIE, Professor of Embryology, University of Chicago. Pp. 278; 18 illustrations. Chicago: University of Chicago Press, 1919.

FERTILIZATION is here regarded as a reaction possessing very definite biological and biochemical characters. In this volume all available experimental data on these characters are collected by a leading investigator in this new field, together with a full discussion of divergent views. The forms used for studying fertilization problems have been mostly marine invertebrates, where both eggs and sperm are shed into the sea-water and where the process of the union of the cells can be followed in great detail and where experimental alterations in chemical constitution, temperature, etc., of the surrounding medium can be readily introduced. The bulk of the work has been done by Americans, and for the most part carried out at the Marine Biological Laboratory at Wood's Hole. The author believes that the head of the sperm contains all the substances necessary for fertilization in spite of the fact that in many forms the entire sperm enters the egg. Although motile activity of the sperm seems necessary for entrance into the egg, it is found that not all sperm which still show motility have fertilizing power. Because Waldeyer found spermia retaining their motility in the human genital tract for three weeks, it has been assumed that they also retained their fertilizing power for that period. But these experiments on lower forms bear out the more recent view of Bryce and Teacher, that about forty-eight hours is the limit of time that human sperm retains the power to fertilize. Most interesting are the author's views on egg secretions and their effect on the activity of the sperm. The effects of the presence of the eggs on the sperm are activation, aggregation and agglutination. An egg secretion, which he names fertilizin, can be dissolved from the egg, and this watery extract produces the same effects as the presence of the eggs themselves. So in fertilization he sees a three-body reaction where the substance borne by the sperm corresponds to

the antigen, the fertilizer to the amboceptor and a substance contained in the egg corresponds to the complement. This conception satisfactorily fits many points in the experimental data, but much work still remains to be done to thoroughly elucidate the phenomena. W. H. F. A.

VENEREAL DISEASES. By C. H. BROWNING, M.D., of the Bland-Sutton Institute of Pathology, and DAVID WATSON, M.D., of Glasgow University. Pp. 336; 75 illustrations (26 in colors). London: Oxford University Press, 1919.

THIS admirable little book is introduced by Bland-Sutton, who sounds its keynote, when summarizing, in the most concise way the wonderful progress made in the last quarter century in our knowledge and control of syphilis, and showing that "with every improvement in the methods of investigating disease, knowledge of syphilis has advanced," while "its fell companion, gonorrhea," is likewise equally deserving of the intimate study here given for the tragic role it plays in life's drama.

The book is really a double treatise, the first half being devoted to syphilis and an equal amount to the subject of gonorrhea. It is written throughout in delightful style and carries the reader forward with ease and interest by its simple diction and clearness of presentation. It is hardly necessary to itemize the chapters of the book and their contents; suffice it to say that it is wonderfully thorough and complete in every detail and served by an accurate index. One finds under syphilis not only the clinical manifestations, but valuable and detailed laboratory procedures; under treatment not only drugs and their administration, but interpretations of the stages of the disease and the varying significance of the Wassermann test and how its bearing should be interpreted on future treatment and marriage.

The second portion, devoted to the subject of gonorrhea, is equally thorough in its exposition and in every way up to date. Certain lessons born of war experience in the control of venereal disease, prophylaxis and treatment are entirely new to the literature of the subject. There is really very little the reviewer finds to take exception to in the book: the prophylaxis recommended differs slightly from that practised in the American Army, in that permanganate of potash (1 to 1000), acriflavin (1 to 4000) or silver nitrate (1 per cent.) is recommended in place of the organic silver salts; the condemnation of making a dorsal slit in acute phimosis; the lack of appreciating the advantages of epididymotomy in acute gonorrheal infection (and the rather broad statement that it always causes sterility); the fact that mention is not made of examining the prostatic secretion in the fresh smear; and the poor character

of a few of the illustrations, especially when compared to the excellent quality of the majority, may, however, be mentioned. Three appendices on laboratory methods is an added value.

The work throughout is indicative of men intimately familiar with their subject, and versed in the most modern diagnostic methods and treatments. A. R.

LECTURES ON SEX AND HEREDITY. By F. O. BOWER, J. GRAHAM KERR and W. E. AGAR. Pp. 119; 49 illustrations. London: Macmillan & Co., 1919.

THIS little volume embraces four lectures on the biological problems connected with reproduction in plants and animals and two lectures dealing with the subject of heredity. These lectures were obviously written for the lay audience and contain very little that is not already known to the medical profession. The chapters on heredity are well written and present, in a very clear manner, the major factors concerned in this interesting subject, including Mendel's law. The book will be of value for elementary instruction in biology to academic students. F. B. B.

THE OXFORD MEDICINE LOOSE-LEAF ADVANCE PAGES. Edited by HENRY A. CHRISTIAN and SIR JAMES MACKENZIE, Oxford University Press. Pp. 109 to 341. New York: American Branch, 1919.

THE advanced pages of Parts II and III of Volume I have just reached the subscribers to the Oxford Loose Leaf Medicine. Part II contains a splendid treatise on pathological physiology and its relation to internal medicine, by A. Walter Hewlett. This chapter is an excellent exposition of the subject-matter and bears rereading. Guy Hinsdale discusses hydrotherapy in Chapter IV. Just enough detail is given to make it practical and very entertaining at the same time.

Undoubtedly the best chapter is devoted to the treatment of disease by Sir William Osler. These lines are written in his usually masterful style and are well worth while. It is, as it were, an epitome of the experience of the therapeutic life of this remarkable teacher and doctor. The causes of disease and how they act is well discussed by James Mackenzie. Disease production by all living organisms forms an interesting portion of this chapter. Eugenics in relation to medicine, by Charles B. Davenport, is assigned to Chapter VII. Here the question of heredity receives ample treat-

ment while paragraphs devoted to applied eugenics are worthy of mention. Billings discusses his favorite subject, focal infection, in the last chapter of Part III. Nothing especially new is dealt with, but an old topic is well taken care of by this well-known authority on the subject.

These two parts of Volume I, as the foregoing description indicates, deal with the usual topics taken up in the first volume of a series on medicine. Viewed as a group they are meritorious from any standpoint whatsoever, whether that be up to date, literary or honest scientific value. The loose-leaf idea is an excellent one and the list of contributors for this system includes the best-known names in medicine both in this country and in England. These points should make it a popular system. T. G. S.

THE CANADIAN MEDICAL WEEK. Published under the Auspices of the Ontario Medical Association. Toronto: The Macmillan Company of Canada, Ltd., 1919.

"EVERY person into whose hands this book comes is a patriot. Many of us are not in khaki; the reason that keeps us comfortably in Canada while our country calls are various. Although the reasons of each satisfy his own conscience, they do not excuse him from devoted patriotic effort at home. It is our duty to study our own problems. Be prepared to carry on!"

The Ontario Medical Association has put in permanent form the records of the meeting of the Association which was held in Hamilton, May, 1918. The volume starts with a tribute to those members of the Canadian Universities who paid the "supreme sacrifice" on active service in the present war, and then is followed by the impressive beautiful "Flanders' Fields," by the late Dr. John McCrae. The papers that were presented to the various sections make up the great bulk of the text. Articles in various phases of eye, ear, nose and throat, medical, obstetrical, gynecological and pediatrics, follow, as well as other branches of medicine. The papers are, for the most part, well prepared and well deserve perpetuation in such a volume as the one at hand. J. H. M., JR.

THE INTERNATIONAL MEDICAL ANNUAL. A YEAR BOOK OF TREATMENT AND PRACTITIONER'S INDEX. Pp. 517. New York: William Wood & Co., 1919.

THE first *International Annual* was published thirty-seven years ago and this 1919 volume, in review, is in every way as comprehensive and as useful as any of the other years. It aims, of course, merely to review the new thoughts concerning diseases and injuries

that have been brought forth during the past year and it very effectively accomplished this purpose. Naturally in this volume considerable space is given to post-war problems. Dr. Hey Groves's and Dr. C. A. Joll's articles on orthopedic surgery and orthopedic appliances are very comprehensive, and Sir Robert Jones's article on manipulative treatment of injuries to joints points out principles that have been accorded general recognition. Fractures and gunshot wounds, surgery of the nerves, surgical shock, neurosis of war, surgery of the abdomen and face are all fully reviewed.

Dr. Carey Comb's article deals with the soldier's heart and lays stress on work carried out under adequate observation as an important factor in bringing about a cure. The recent literature on cerebral fever and influenza is fully considered by Dr. Rolleston. Dr. S. A. Kinnier Wilson writes on encephalitis epidemic. In an instructive article by Dr. C. S. Bacon on the vomiting of pregnancy it is mentioned that alcohol is very valuable, but he cautions against giving it too strong or in too large a quantity. In Dr. Latham's article on pneumonia mention is made of treatment with quinin urea hydrochloride.

Skin diseases and eye diseases are very well covered. Of special interest are Dr. Foster's studies on trachoma. Excellent illustrations accompanying his article on diseases of children receive their just consideration, and very good reviews appear on infant-feeding, marasmus, ileocolitis, diarrhea, tetany, vulvovaginitis, rickets and infectious diseases. Dr. John Comrie gives some excellent diet tables in his article on diabetes, and mention is made of the many contradictory reports as to the value of sodium bicarbonate in the treatment of this disease. Syphilis and gonorrhea are considered, and an interesting page appears on the efforts of soldiers to counterfeit these diseases to secure admission to the war hospitals.

An interesting criticism of the metric system appears in the introduction, and sympathy is expressed for our continental colleagues who are compelled to use that system.

As usual the dictionary of remedies appears, which gives new uses for old remedies and a description of many new remedies.

A very complete index makes reference easy. The volume will prove very useful, indeed, especially to those who have not the time nor the facilities to keep up to date with current medical literature.

C. N. S.

SURGICAL CLINICS OF CHICAGO. Volume III, No. IV. Pp. 287; 117 illustrations. Philadelphia: W. B. Saunders Company, August, 1919.

IT has been the reviewer's good fortune to be called upon to report as a reviewer on the *Surgical Clinics* at various times. This last number is, in his opinion, the best turned out in several months.

The first article on peripheral nerve surgery is an extremely interesting and instructive one, coming at a most opportune time. The writer, Lewis, is admirably fitted for writing on the subject, after his experiences in war surgery in the A. E. F. C. P. Nesselrode's article on cranial osteoperiosteal grafts contributes many useful points in technic as well as symptomatology. E. W. Ryerson, in the report on his clinic, demonstrates very ingenious and satisfactory reconstructive methods of surgery on the acromioclavicular and elbow-joints. L. J. Pollock, on brachial plexus lesions, and F. A. Norris and R. S. Reich, on foreign bodies in the tissues contribute articles which complete the war-surgery portion of this number of the *Clinics*.

The remainder of the twenty articles are on civil surgery and are written by such men as A. D. Bevan, Ochsner, Eisendrath, Davis, Kellogg, Speed, Kretschmer and others.

An added feature of interest in the *Clinics* is the universal appearance at the conclusion of each case a report of the ultimate results obtained in the case. This certainly lends weight to the article preceding. E. L. E.

STERILITY IN WOMEN. By ARTHUR E. GILES, M.D., B.Sc. (Lond.), M.B., Ch.B. (Vict.), F.R.C.S. (Edin.), M.R.C.P. (Lond.), Captain, R.A.M.C. (Temp.), Senior Surgeon to the Chelsea Hospital for Women; Gynecologist to the Prince of Wales's General Hospital, Tottenham. Pp. 196; 11 illustrations. London: Henry Frowde and Hodder & Stoughton, 1919.

WITH the loss of hundreds of thousands of potential fathers in the last few years and the consequent limitation of marriages it has become increasingly important that the marriages which are consummated should be fruitful. In this timely appearing book Giles has presented the causes of sterility in male and female and the measures to remedy the conditions.

The first chapter deals with man's share of the responsibility for childless marriages and includes various detailed tests for determining his procreative ability. The second chapter is a collection of statistical tables and surveys. Following this the bulk of the book takes up the various classifications, types and causes of sterility. Functional, primary, congenital and acquired and secondary sterility are discussed. The author adds to the well-known one-child sterility a section on two-child sterility. The chapter on diagnosis gives an outline well adapted to systematic use. The chapter on treatment is a well-balanced discussion of the various measures which have been found useful. The general bibliography, ten pages in length, dates back to 1609. The book will merit attention from those interested in the subject. P. F. W.

ATLAS OF OPERATIVE GYNECOLOGY. By BARTON COOKE HIRST, M.D., Professor of Obstetrics, University of Pennsylvania. Pp. 292; 164 plates, 46 figures. Philadelphia and London: J. B. Lippincott Company, 1919.

As the title implies, this book is devoted to the graphic method of describing operations for conditions peculiar to women and in the preparation of the atlas conditions common to both sexes have been purposely omitted. The volume is profusely illustrated with actual photographs as well as drawings from life. In the beginning of the book the author describes in detail his clinic, preoperative preparation, instruments and postoperative care of patients as carried out at the maternity department of the hospital of the University of Pennsylvania. The bulk of the book is devoted to the description of various operative procedures, the text being more or less supplementary to the illustrations. As has been his custom for many years, the author recommends the intermediate repair in perineal lacerations and describes an operation that he has devised and which he terms a "rational perineorrhaphy." The technic of salpingectomy which the author recommends can hardly be accepted with approval, as there is an utter disregard of the ovarian blood supply, and recent investigators have shown this point to be the most important one in the technic. The author's extensive experience with the various methods of performing Cesarean section makes the chapter of the book devoted to this topic a most valuable one, while the chapter on operations upon the mammary gland, which concludes the book, is concise and fits in well with the preceding chapters. To those who have had the pleasure of reading the author's previous publications this work will be a welcome addition. F. B. B.

CLINICAL CASE-TAKING. By ROBERT D. KEITH, M.A., M.D. (Aberd.), formerly Principal of the King Edward VII Medical School, Singapore; Consulting Physician, Tan Tock Seng's Hospital, Singapore; Lecturer on Clinical Medicine in the King Edward VII Medical School. Pp. 104. New York: Paul B. Hoeber, 1919.

THE little book in hand is written as an elementary guide to students who are just starting the study of clinical medicine. It first deals with the general examination of the patient, including the history. Physical examination and the various systems of the body then follow. The concluding chapter is on laboratory examinations. The book is extremely brief and is limited to the outstanding features of the several conditions that are discussed by the author. J. H. M., JR.

PROGRESS
OF
MEDICAL SCIENCE

SURGERY

UNDER THE CHARGE OF

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ASSOCIATE PROFESSOR OF APPLIED ANATOMY AND ASSOCIATE IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE PHILADELPHIA GENERAL, ST. AGNES AND NORTHEASTERN HOSPITALS.

Some Points about Bone Grafts.—WHEELER (*British Med. Jour.*, February 1, 1919, p. 119) from a study of thirty war cases says: Whatever the histological role, the clinical usefulness of a bone graft is not affected. The final success of bone grafting in cases in which a gap is bridged depends upon the operation of Wolff's law, *i. e.*, the graft, stimulated by strains and stresses changes its internal architecture and external formation until the required strength is attained. In other words "the amount of growth in a bone depends on the need of it." (Murphy). The periosteum should be left on a graft, because, although not essential, it is the medium through which new bloodvessels enter the graft and the surrounding structures. Furthermore, in removing the periosteum superficial layers of osteoblast may be sacrificed. A periosteum-covered graft is less likely to become rapidly absorbed. To provide the strains and stresses it is advisable to allow the graft to functionate as early as possible, but in most cases preliminary fixation for three months is necessary. In old ununited fractures with false joints the bone in the critical area (near the site of fracture) is sclerosed and avascular, and makes an unsuitable soil for that portion of the graft in contact with this area. Growth in the graft is impeded by the surrounding sclerosis. Dense sclerotic bone has no osteogenetic power. In such cases a periosteum-covered graft, instead of exhibiting osteogenetic powers and responding to Wolff's law, may become attenuated and absorbed or break in the critical area five or six months after operation. In the same class of cases very prolonged fixation is particularly unfavorable to osteogenesis, to the establishment of blood supply and bony union. Early movements and the bearing of mechanical stress and strain, on the other hand, may lead to yielding of the graft and failure. The problem is a difficult one in the case of the humerus or femur, where strength is essential from the commencement of treatment, but may be solved by wide resection of the sclerosed

bone, and resignation on the part of the patient to a short limb. But for slightly slower osteogenetic powers, and a real tendency to fracture, the intramedullary peg is effective. This method of bone grafting is satisfactory in the case of the radius and ulna. In the case of the humerus and femur, long stout inlay grafts give the best results. Sliding grafts should be employed only in simple and fresh cases. The bone graft has inherent bacteria-resisting properties. Absolute fixation of the graft in its bed, either as part of the operation, or afterward by splints or plaster, is essential to success. Bone grafting for spinal caries is followed by more uniformly successful results than is seen elsewhere. This is to be expected, since both the graft and the recipient bed (in the region of the spinous processes) consist of healthy bone. As in the operation of tendon transplantation and nerve suture, the operation of bone grafting should be preceded by correction of any existing deformity and by the freeing of adhesions in neighboring tendons and joints.

Total Enucleation of the Prostate.—FREYER (*British Med. Jour.*, February 1, 1919, p. 121) says that in 1912 he reviewed 1000 cases in which he had performed his operation of prostatectomy and that now he wishes to add a further series of 550 cases. He emphasizes particularly the employment of the operation in advanced old age and in those conditions in which it is desirable to divide the operation into two stages—namely, (1) a preliminary suprapubic cystotomy for drainage of the bladder, and (2) enucleation of the prostate at a subsequent date. He recognizes three definite conditions in which it is advisable to drain the bladder before removing the prostate. (1) When the bladder is very septic, generally complicated by the presence of phosphatic calculi, and particularly when there is reason to believe that the kidneys are secondarily affected, as indicated by recurrent attacks of rigors and pyrexia with emaciation and debility of the patient. (2) When, no catheter having been previously used, the patient has intensely frequent but painless micturition with dribbling the result of an overdistended bladder. He is developing symptoms indicative of incipient uremia and the disease is advancing insidiously. He has one or two ounces of residual urine. The bladder should be slowly drained by the use of a retained catheter of narrow calibre and a suprapubic cystotomy performed in a few days, the enucleation of the prostate being deferred for a fortnight longer, until the kidneys have regained their normal functions and all the uremic symptoms have disappeared. A large retained catheter may produce sufficient drainage without the cystotomy. Freyer does not favor the division of the operation into two stages except when absolutely necessary. He did the two-stage operation only 72 times out of a total of 1550 operations. Apart from the extra period the patient must stay in bed, it is much more difficult to enucleate the prostate when deferred for ten days or longer after the cystotomy, for the tissues around the suprapubic wound will have become tense and rigid from the plastic lymph thrown out, with the result that the abdominal wall will not be soft and yielding to the hand, the finger of which is in the bladder for the enucleation and there will be difficulty in reaching the distal aspects of the prostate.

Pneumonias Following Injections of Arsenobenzol. — SCHWERDTFEGER and TINKER (*Am. Jour. Syph.*, 1919, iii, 398) say that the ordinary reactions following intravenous injections of the various preparations of arsenic in the treatment of syphilis are well known. Intravenous injections of arsenobenzol were given to nine syphilitic soldiers on November 23, 1918, at the U. S. General Hospital No. 26, Fort Des Moines, Iowa. All had symptoms immediately after the injection, or within a few minutes, of irritation to the respiratory tract and within a few days developed bronchopneumonias. They were critically ill, but made complete recoveries. The writers describe the clinical features of the reactions, the preparation of the solutions, the technic of its injection, and then attempt to determine the cause of the reactions. Extreme dyspnea was the outstanding feature in the clinical picture. By the exclusion of all other possible causes it was concluded that the drug was responsible for the reactions. In a succeeding paper by Jay Frank Schamberg presented as "Comment" on the paper of Schwerdtfeger and Tinker it is stated that "the fault lay with the operator, for the instructions accompanying the ampoules state distinctly a concentration of 0.6 grams in 100 to 120 c.c. of water, instead of which nearly 0.5 grams were given in less than one-fifth of this volume."

Choice of Methods in Operations upon the Pituitary Body.—FRAZIER (*Surg., Gynec. and Obst.*, 1919, xxix, 9) says that the life history of the pituitary tumor is a matter of no small significance. In its pathological deviations the pituitary is not unlike the thyroid gland. As with the thyroid so with the pituitary the most common lesion is the adenoma, in both instances often with cystic developments. It is within the limits of a reasonable estimate to say that 75 per cent. of pituitary tumors may be classified as adenomata. In fact the more minutely specimens are examined and the greater the experience of the examiner, the smaller the percentage of malignant growths. While pituitary lesions at best present many grave aspects, the absolute benignity of the underlying process in the majority of instances detracts somewhat from an otherwise serious situation. In other words if means can be devised to prevent the recurrence of local or general intracranial pressure, the life and comfort of the patient may be assured for many years. As a result of the larger and longer experience in dealing with pituitary disorders he has been able to formulate with greater precision the conditions under which surgical therapy is indicated. The symptoms of pituitary disorders which must be reckoned with are: (1) those due to general intracranial pressure, such as headache; (2) those due to involvement of the optic chiasm and tract—the ocular phenomena; (3) those due to involvement of the neighboring structures; and (4) those due to secretory derangement. As yet Frazier has had no cases under his care where justification for the risks entailed in operation were furnished by the secretory disorders, such as acromegaly or the Froelich syndrome, or by neighborhood symptoms, so that in large measure the surgeon is asked to intervene for one of two conditions, either distressing headache or vomiting or failing vision which, in the mind of the patient, provides the imperative demand for relief. Unfortunately, in the majority of patients who have consulted him the optic atrophy is already so far

advanced that restoration of vision is out of the question. In the constructive period of any field of surgery, the pendulum of opinion swings from one view to another. Frazier's first introduction to pituitary surgery was through the frontal route. Later a number of his cases were operated upon by the transnasal route, but its limitations soon became apparent and he returned with certain revisions to his original fronto-orbital technic. The surgeon dealing with pituitary lesions should be familiar with both methods, but as time goes on he believes the fronto-orbital route will be found to have a wider field of application.

A Study of Bladder Function.—CURTIS (*Surg., Gynec. and Obst.*, 1919, xxix, 24) says that whether he shall leave an ill-functioning bladder to right itself or shall assist nature through the use of a catheter, is a problem of much importance; it concerns not only the bladder of the soldier with spinal injury, but also many other conditions, notable among which is stasis of urine after operation. Failure to catheterize the paralyzed bladder is followed (in rabbits at least) by back pressure of urine which is exceedingly destructive to kidney tissue. Associated urinary infection is frequent. Irregularly performed catheterization for retention of urine is unsatisfactory. Patients so treated are subjected to such dangers as accompany the passage of the catheter and at the same time are rendered liable to accumulations of infected stagnant urine. Carefully managed catheterization, of the bladder which fails to empty spontaneously, yields excellent results; the catheter should be regularly passed often enough to prevent vesical distention and its use must be persisted in until daily tests show that residual urine is no longer being retained in the bladder.

Gunshot Fracture of the Femur.—BUCHBINDER (*Surg., Gynec. and Obst.*, 1919, xxix, 70) says that fracture of the femur ranks first in so far as difficulty in treatment is concerned. Because of the relatively large size of the thigh, it is impossible, except by open operation, to obtain and maintain reduction with the same ease and accuracy as can be secured in fractures of the smaller extremities. More frequently than in any other type of fracture, the end-results in their cases have been accompanied by some degree of permanent disability. No septic wound is more difficult to control than a deep intermuscular phlegmon of the thigh, particularly when caused by high explosive shell or fragments. Buchbinder devoted his study to the details of treatment of this type of fracture and to the exposition of a simple and highly efficient method of standardizing this treatment: He says that immediate and continuous immobilization lessen the likelihood of sepsis. The caliper modification of the nail extension is a particularly valuable method of reduction, because: It is far more dependable in its extension and with less weight than a Buck's extension. It permits complete exposure and opportunity for inspection of the thigh at all times. It permits as does no other method, early and continuous mobilization of the knee-joint. It is more comfortable to the patient.

THERAPEUTICS

UNDER THE CHARGE OF

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AND

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The Administration of Arsphenamin. — HYMAN (*Boston Med. and Surg. Jour.*, 1919, clxxxi, 353) describes the technic of administering arsphenamine and advocates a standard method of administering the remedy. There is no question of the value of having a standardized method of administering such a widely used remedy but the diversity of opinion of clinicians and investigators of this drug has to this time prevented the solution of the problem. McCoy of the Public Health Service has recently issued a circular with such a purpose in view but his views have not been accepted by a number of clinicians. The author of this article is of the opinion that McCoy's statements have been too emphatic to meet with unanimous approval. The administration of arsphenamine is frequently attended by more or less severe reactions and the avoidance of these reactions is the ideal to be attained by proper administration. In Hyman's series of 500 doses, reactions occurred in 58 instances or 11.6 per cent. The reactions have occurred with diminishing frequency, which he believes due to the application of principles developed from an intensive study of the reactions occurring in the first 100 doses. Hyman considers the reactions that follow the administration in four general groups. The first group shows an immediate reaction to the intravenous injection of the solution, indicated by an increasing congestion of the bloodvessels of the face and neck. The patient becomes cyanotic and dyspneic and seems critically ill. This reaction is believed to be due for the most part to an increase in the fluid content in the circulating system and can be avoided by bleeding before the injection of arsphenamine. Certain vasodilator drugs have also seemed to prevent the development of these symptoms. The second type of reaction, the most common, develops within the first twenty-four hours, usually within a period of from three to eight hours after the injection. Nausea, vomiting, hyperpyrexia, headache, vertigo, severe abdominal pains, diarrhea, or general pains throughout the bones are the chief symptoms. This reaction, according to Hyman, is essentially a manifestation of alkalosis and can be successfully treated on this basis. The fact that it is impossible to calculate with any accuracy the amount of alkali required to neutralize a given solution of dissolved arsphenamine and to redissolve the precipitate is well known. The tendency is almost universal to add an excess of alkali. Therefore such reactions can be avoided by more care in the preparation of the solution. It is stated in addition that the administration of acids will relieve the condition. Hyman mentions the juice of citrus fruits, vinegar salads, pickles,

sodium acid phosphate, as the proper remedies. The third type of reaction is not common, and may be described as a subacute or delayed arsenic poisoning with its well-known clinical picture. The fourth type of reaction, the so-called Horxheimer reaction, was only observed once in the author's series. Nothing relative to the prophylaxis and treatment of the reactions falling in the third and fourth group was learned in this series. Hyman believes that these disagreeable complications may be entirely eliminated or greatly reduced by observing the precautions noted in his article. The author recommends the administration of arsphenamine by gravity together with physiological salt solution.

Reactions Following the Administration of Arsphenamine.—Hyman (*Jour. Am. Med. Assn.*, 1919, lxxiii, 901) reports on reactions following the administration of arsphenamine in a series of 25,000 injections. He states that reactions have their origin in drug toxicity, technical errors, or in causes relative to the patient himself. There is a wide variation of opinion as to a correct technic by equally eminent authorities, but certain essentials have been established as the result of clinical experience and animal experimentation. The use of dilute solutions in freshly distilled water and slowness of administration are generally accepted. Proper neutralization is an important factor. In Guy's experience the arsenobenzol brand of arsphenamine has made a better record than salvarsan; though later this difference was but very little. He believes that arsphenamine is a comparatively safe product and that errors in preparation and in technic of administration produce the majority of the reactions. However, even with the best of technic, and with a drug that is comparatively non-toxic, reactions will be encountered that have their origin in the patient himself. These are the most difficult to avoid and great care must be used as regards the amounts of the remedy administered to patients with impairment of renal, hepatic, pulmonary, digestive, etc., functions. The status of the syphilitic infection itself has something to do with the incidence of reactions. Febrile reactions have been noted most frequently in the florid secondary stage of the disease. Guy thinks it reasonable to believe that some reactions are due, at least in part, to the destruction of enormous numbers of spirochetes, liberating the protein of their bodies into the blood stream with the production of an anaphylactic type reaction. Guy gives the details of the technic of administration, for which the original article should be consulted.

The Administration of Arsphenamine.—McCoy, in a note (*New York Med. Jour.*, 1919, cix, 879) on the administration of arsphenamine, says that when the numerous complaints received by the U. S. Public Health Service regarding arsphenamine are investigated, it is almost invariably found that the drug has been used in a solution that is too concentrated and that it has been administrated too rapidly—as much as 0.4 gm. in a volume as little as 25 c.c. having been injected within thirty seconds. Such practice is abuse, not use, of a powerful therapeutic agent. He recommends that, in addition to the usual precautions, physicians give the drug in concentrations of not more than 0.1 gm. to 30 c.c. of fluid and allow a minimum of two minutes for the intravenous injection of each 0.1 gm. of drug. This would

necessitate from 90 c.c. to 180 c.c. of solution for the doses usually given and would require from six to twelve minutes for the injection. In this way, McCoy believes, the number of reactions would be very materially reduced.

PEDIATRICS

UNDER THE CHARGE OF

THOMPSON S. WESTCOTT, M.D., AND ALVIN E. SIEGEL, M.D., OF PHILADELPHIA.

Certain Malnutritional Disorders of Children Associated with a Putrefactive Intestinal Flora.—PORTER, MORRIS and MEYER (*Am. Jour. Dis. Children*, October, 1919) report the results of their study to establish the fact that there is an etiologic relationship between protein-splitting bacteria and certain types of alimentary intoxications that occur during the earlier years of life. The types of intoxication studied were: A mild type constipation, lack of gain, pallor, head sweating and loss of turgor, the so-called balance disturbance of the Finkelstein school; a fulminant acute type with sudden onset, profound cumulative toxemia, tremendous shock, alarming loss of weight and too often an early fatal issue with acidosis; a grave chronic type with diarrhea which occurs for the most part between the tenth and twentieth months, characterized by frequent stools, anorexia, progressive loss of weight and increasing toxemia, and which earlier classed as "Coeliac disease, pancreatic insufficiency, chronic alimentary intoxication;" certain sporadic, acute, putrid diarrheas of young infants; a type of chronic malnutrition to be found in older children, which in its clinical features corresponds to the balance disturbance of infants, but in which the symptoms are modified by the difference in the ages and dietetic habits of the patients. From their studies the authors found that children whose diet was well balanced and whose nutrition was normal, have an intestinal flora consisting of fermentative and putrefactive types without a preponderance of either; that children fed on large quantities of cow's milk have a more complex flora, made up of various types, most of which are facultative putrefactors; that in children who suffer from certain types of alimentary intoxication with malnutrition, the intestinal flora departs in a uniform manner from the normal, and that this departure is always characterized by the establishment of bacterial types predominatingly putrefactive; that the return of these children to normal health is coincident with a regression of the intestinal flora toward a predominatingly fermentative type, and a later swing to a balance between these types; that such changes in the intestinal flora can be brought about in the intestine of the human infant by withdrawing animal protein, and persistently feeding large amounts of lactose (from 2 to 4 ounces daily), and other carbohydrates; that the period which may be necessary to produce this variation is from ten to forty days; that feeding acidophilic cultures has in a few cases aided

in a more rapid establishment of aciduric flora in the baby's intestine, this influence was not very great; that the progressive cessation of the symptoms of intoxication, and a return of toxemic patients to a nutritional health coincides with the recognizable dominance of a fermentative flora; that lactose and dextrin are the carbohydrates most effective in encouraging the rapid establishment of a fermentative flora in the intestines of infants and children.

The Insusceptibility of Man to Inoculation with Blood from Measles Patients.—SELLARDS (*Bull. Johns Hopkins Hosp.*, September, 1919) says that he made an effort to determine whether the virus of measles exists in the circulating blood of a patient, permitting the transfer of the disease from person to person by the inoculation of blood. Two cases were reported previously by Hektoen in which the disease was successfully transmitted by inoculation. The author failed to transmit the disease in 8 cases. The clinical phenomenon of the origin of the rash on the face or the upper part of the body with its gradual progress downward requiring from one to three days to complete this march, is interesting. The symptoms of the two experimental cases that have been reported were not entirely characteristic of the classical type of measles. Although the disease varies extremely little in its clinical manifestations distinct modifications might readily occur under experimental conditions. As regards the negative results in the 8 cases of the author, the principle difficulty arises in establishing, by the clinical history, the susceptibility of an adult to a disease so generally prevalent as measles. In some of the men who were inoculated the circumstantial evidence of susceptibility was very strong. Failure to transmit the disease by the injection of blood does not preclude the existence of the virus in the blood stream even in moderate amounts. There was some evidence that these individuals not only failed to become infected, but that they were actively immunized by the injection of the blood. This would presuppose the existence of the virus in the blood. The agent which excites the rash might readily gain access to the blood stream regardless of whether its distribution takes place by the lymphatics or by the circulating blood. The constant origin of the eruption on the upper part of the body and its gradual and orderly extension downward is quite unlike the development of eruptions in which the virus is known to be distributed by the circulating blood.

Study of the Stools in Children's Institutions Showing the Incidence of Intestinal Parasite Infections.—DEBUYS and DWYER (*Am. Jour. Dis. Children*, October, 1919) found in their study of 595 individuals in seven institutions that the frequency of infection by the various parasites was in the following order: Trichuris trichiuria, Ascaris lumbricoides, Hymenolepis nana, Oxyuris vermicularis, Necatur americanus, and Hymenolepis diminuta. The hygiene, general care, duration of residence in the institution, previous environment, association with dogs, eating of dirt, absence of systematic medical inspection, seemed to have a direct bearing on the frequency of intestinal parasitic infection. The two institutions where systematic medical inspections were made, even though there were many crawlers in one of these institutions, showed the lowest percentage of infections, namely, 17.89

per cent. and 19 per cent. respectively. The two institutions where the heaviest infections were found, were those where the population was transient, and where there were no medical inspections, the infections being 90.2 and 83.33 per cent. respectively. The youngest individual infected was in the least sanitary of the institutions investigated. This child was two years of age and had a quadruple infection of Trichuris trichiuria, Ascaris lumbricoides, Oxyuris vermicularis, and Strongyloides stercoralis. The relation of age to infection seemed negligible except that there was no infection among infants. The maximum number of infections occurred at the age of eleven years. Males were infected over 13 per cent. more frequently than were females. The element of exposures seems to have had some influence. The maximum ages of infection in boys were eleven and twelve years and for girls thirteen years. No information of value was obtained in studying the incidence at the different ages except that the greatest incidence in boys was fourteen infections in twenty boys, or 70 per cent. of infections at the age of twelve years, and for the girls fifteen in twenty-one or 71.5 per cent. of infections at the age of eight years. The symptoms usually attributed to "having worms" were as frequent, and some more frequent in those not having parasites. One infection with the rat tapeworm (Hymenolepis diminuta) was found in a female child three years of age. The infection occurred in association with Trichuris trichiuria and Ascaris lumbricoides. An eosinophilia was found to be a valuable aid in the diagnosis of infection with intestinal parasites. It is not pathognomonic and its absence does not exclude an infection. The eosinophils were found as high as 28 per cent. in the positive cases and 18 per cent. in the negative cases. They were 4 per cent. or above in 59.5 per cent. of the positive cases and 4 per cent or above in 32 per cent. of the negative cases. It was of interest that all of the eosinophilias of 15 per cent. and above in the positive cases occurred in the same institution. No parasite seemed to have a definite eosinophilia. It was shown that infections by any of the intestinal parasites could exist with an absence of eosinophilia. This was found in all infections with the exception of Necator americanus and Hymenolepis diminuta. The first was found in single infection in only 2 cases, in which instances the eosinophils were 12 and 13 per cent. respectively. In mixed infection with Trichuris trichiuria and Hymenolepis nana the eosinophils were as low as 1 per cent. The other exception was the Hymenolepis diminuta, which was not found in single infection, but in combination with Trichuris trichiuria and Ascaris lumbricoides, in which cases the eosinophils were 13 per cent. Minimum eosinophile counts in double and triple infections were zero, while the maximum was 28 per cent. in each. The two quadruple infection in which blood examinations were made showed an 8 and 9 per cent. eosinophilia respectively. The diagnosis of intestinal parasitic infection is very easy. The symptoms usually ascribed to worms are as frequent in those not infected as in those infected. Blood examination showing eosinophilia are valuable diagnostic aids, but the only method of making a positive diagnosis is by finding either the parasite or the ova in the stool. Vermifuges should not be given to the defenseless child unless it is known that an infection exists and its character is ascertained so that the specific drug may be given.

Organotherapy in Certain Diseases of Childhood.—McCready (*Med. Record*, September 27, 1919) says that the endocrine glands control metabolism and preside over growth and development in infancy and childhood; they are essential to mental, physical and reproductive efficiency in adult life, and they maintain catabolic balance in the period of decline. Many diseases and conditions of childhood are manifestations of organic inferiority in the etiology of which dysfunction of the endocrine glands is a more or less prominent and contributing factor. Treatment directed toward the stimulation, modification, and correlation of the action of the endocrine glands is a promising field for therapeutic endeavor. Treatment by organotherapy should be preceded by a careful analysis and consideration of the symptoms of the endocrinous dysfunction. He found that the usual doses of organic preparations especially thyroid are too large, are administered without due cause, often in unsuitable cases and tend to discredit a valuable therapeutic measure.

Congenital Syphilis.—DeBuys and Loeber examined 106 infants and children in a foundling institution both by the Wassermann and luetin tests. That these were accurately performed was proved by controls. Negative Wassermanns were explained by the intensity of the treatment to which each child had been subjected, or because the bloods had not yet become positive. The luetin test in this series proved of greater value than the Wassermann reaction in detecting cases of congenital syphilis, and the clinical findings were of the greatest value at that time when the value of the luetin was at its minimum during the first few weeks. Because of the ages of those examined and the character of the institution, this investigation afforded an excellent opportunity to study the various available means of detecting the existence of congenital syphilis. Seventy-four and six-tenths per cent. were infants up to the age of two years, of whom 41.6 per cent. were under one year of age. Congenital syphilis was found to be relatively more frequent in the illegitimate than in the legitimate children. This study points out that skin eruptions of syphilitic origin may exist with the Wassermann and luetin reactions both negative. This emphasizes the necessity of exhausting every means of diagnosis especially the laboratory methods and complete physical examination. The skin reactions were more frequent in the younger subjects, twelve of the twenty-two instances being found in the first three months of life. Ten cases of positive syphilitic skin eruptions were detected at this time in which the luetin reaction had been negative. With very few exceptions all of the inmates of the institution were below the normal averages of weight, height, development and nutrition. Enlarged livers, spleens, and glands were the most constant clinical evidence of congenital syphilis. The incidence of congenital syphilis in this institution was 83.96 per cent. Seventy-nine cases, or 74.53 per cent., were shown by means of the luetin, and 10 cases, or 9.43 per cent., were shown by the clinical findings, revealing syphilitic skin eruptions. Many of the other cases classified as doubtful or negative, had certain of the clinical symptoms of congenital syphilis but were not sufficient to warrant a positive diagnosis.

OBSTETRICS

UNDER THE CHARGE OF

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Pregnancy Complicated by Epidemic Influenza. — TITUS and JAMISON (*Jour. Am. Med. Assn.*, June 7, 1919) report their experience in 50 cases of pregnancy complicated by epidemic influenza. They believe that epidemic influenza and pneumonia have so much in common that the study of influenza will throw light on the treatment of the ordinary type of pneumonia. Pregnancy greatly increases the mortality from epidemic influenza. In 42 per cent. of these patients studied, abortion or premature labor developed. The mortality of epidemic influenza in pregnant women, in whom pregnancy was not interrupted, 48.2 per cent.; but, when pregnancy was interrupted, the mortality rose to 80.9 per cent. An interruption of pregnancy is caused by the destruction of oxygen in the blood and excessive accumulation of carbon dioxid in the blood and a degree of toxemia sufficient to cause the death of the fetus. In the early months of pregnancy, abortion will not usually develop as soon as the embryo dies. In the later months, pregnancy may be interrupted without the death of the embryo. The ill effect of abortion or labor in women suffering from epidemic influenza results from muscular exertion, increasing the excessive amount of carbon dioxid in the blood and straining a weakened heart; also from the sudden release of intra-abdominal pressure following the expulsion of the fetus, in advanced pregnancy, and the sudden reduction of blood-pressure by the hemorrhage occurring at labor; and also by the lessened resistance of the patient to the ordinary disturbance of labor. Treatment should be preventive, and pregnant women should be urged to avoid all possible exposure to influenza, pneumonia or common colds. In cases of infection, absolute rest, fresh air, stimulation, elimination, the avoidance of violent purging and quinine sedatives are required, and the prompt termination of labor or abortion will be indicated. In labor it may be necessary to use forceps promptly. Anesthesia is contra-indicated and not required, because patients are usually so toxic as to be indifferent to pain. Whether the delivery be instrumental or spontaneous, precaution should be taken against hemorrhage and the uterus should be packed if needed. Normal salt solution should be used, preferably under the skin, to avoid the overloading of the circulation, which might result from intravenous injection.

Abdominal Pregnancy Continuing Four Months after Uterine Perforation; Operation and Recovery.—BISHKOW (*Jour. Am. Med. Assn.*, June 7, 1919) reports the case of a multipara, whose husband died two weeks following the menstrual period. As menstruation did not return the following month, the patient went to a midwife, who introduced a soft rubber catheter into the uterine cavity, where it remained two days. One week later, this was repeated, and the patient bled for three days.

Two weeks after abortion, she entered Bellevue Hospital, New York, having abdominal cramps, with epigastric pressure, where she remained one week. She refused to have curetting done, and left the hospital. Some months after, she entered the Michael Reese Hospital, where she remained three days, under observation. She then left and went to work in a tailor shop. In both hospitals she denied abortion and gave misleading statements. For the next three months, at her menstrual periods, she had a dark, foul-smelling discharge for two or three days. About a month after her last period, while at work, she had sharp pain in the rectum, becoming dizzy and with great disturbance of the circulation. Upon examination, she complained of cramp and slight nausea, was slightly pale, but with normal pulse and temperature. There was no marked tenderness or rigidity in the abdomen. On vaginal examination, the cervix was firm, with lateral lacerations. No tenderness or bulging in the vaginal fornices could be detected; the uterus could not be made out. Upon examination, under ether, a probe introduced into the uterine cavity passed through the uterus for some distance, and a diagnosis for perforation of the uterus was established. At operation, there was abundant dark hemorrhage in the abdomen, and the fetus was found among the intestines, advanced about five months. The cord extended from the fetus to the uterus, the uterus was slightly enlarged, firm and, at the fundus, was a smooth necrotic mass the size of a small orange. There was a transverse tear at the junction of this mass with the fundus anterior, and protruding from this were the placenta and its membranes, the umbilical cord extending through this opening. The tubes and ovaries were normal. The body of the uterus was removed, the patient finally recovering. Upon examination, the uterine wall had perforated to the right of the median line at the fundus; the placenta extended over the margin of the perforation. Undoubtedly, the catheters introduced had caused the perforation, and the products of conception had been expelled through the perforation into the peritoneal cavity. Enough of the placenta to keep the fetus alive remained attached. The rest protruded through the perforation, partially filling the opening and controlling the hemorrhage, to some extent. This circumstance probably saved the woman from death by bleeding. A false sac composed of fibrin had formed around the fetus and the placenta. The rupture of this sac and the expulsion of the fetus into the peritoneal cavity had caused the acute symptoms. The fetus had undoubtedly lived four months in the peritoneal cavity. Two similar cases are recorded, one by Henrotin, in which perforation occurred at two months, and the operation was done a month and a half later. The fetus was extra-uterine, but the placenta was fully within the uterine cavity. Leopold reported a case in which rupture of the uterus took place in the fourth month, from a fall, and pregnancy continued to term in the peritoneal cavity. The perforation of the uterus in criminal abortion is not infrequent.

Pubiotomy.—JELLETT (*British Med. Jour.*, May 10, 1919) presented a paper on this subject, in the Section of Obstetrics, in the Royal Academy of Medicine, in Ireland. He believes that this operation is of decided value, and gave statistics of thirty-five (35) operations, with two maternal and five fetal deaths. One mother died from fatty

degeneration of the heart; the other from tuberculosis. One of the infants that died was a twin and one had hydrocephalous. He believes that the operation leaves the woman permanently in better condition, and cited two cases with the same degree of pelvic contraction. One had four Cesarean sections; the other had pubiotomy done at the first labor and afterward had three spontaneous labors and one terminated by forceps; all of the children surviving. He emphasized the fact that pubiotomy leaves the pelvis permanently enlarged. In 22 labors occurring subsequent to the labor in which pubiotomy was done, 11 children were born spontaneously, 6 by forceps and 2 by a second pubiotomy, 3 children were born dead, one death being due to placenta previa. He believes that pubiotomy is indicated in both the first and the second degree of pelvic contraction. Cesarean section is a means only of terminating labor, while pubiotomy leaves the pelvis permanently enlarged. He urges that pubiotomy should never be postponed willingly to the end of the second stage of labor, but should be carried out independently of pregnancy, in cases in which the pelvis is contracted. In the management of these cases after operation, every effort should be made to prevent bony union of the cut surfaces. The operation should not be attempted where the true conjugate was less than 7 cm. He urged that the prejudice which has existed against the operation should be laid aside. In discussion, doubt was expressed as to the permenent enlargement of the pelvis. It was also thought unwise to do the operation upon a patient not pregnant or in the early period of gestation. If it were to be done before labor, the operator should wait until the child was viable.

A Method of Delivering the Placenta.—BAER (*Jour. Am. Med. Assn.* May 24, 1919) draws attention to conflicting methods of delivering the placenta. His own custom is as follows: After the usual period of waiting, averaging half an hour, and when the uterus is at the height of the contraction, he grasps the abdominal wall crosswise above the fundus and pulls the rectus muscles together, thus raking up all the slack. The woman is then urged to bear down. If there should be adherent membranes they are treated in the same fashion which may follow any other method of expression. The advantage claimed for this procedure is a total avoidance of handling or pressure on the uterus, which is considered of great practical importance.

Postmortem Cesarean Section Following Death from Influenza Pneumonia.—HEPPNER (*Jour. Am. Med. Assn.*, March 8, 1918) in 108 cases of influenza complicated by pregnancy found that but one was treated by Cesarean section. This was a patient, aged twenty-four years, in her third labor. She was admitted in a moribund condition, markedly cyanotic and profoundly toxic. She was said to have been sick for six days before admission to hospital. It was evident that she had a moderate bilateral basal bronchopneumonia. The fundus of the uterus was 3 cm. above the level of the umbilicus. The fetal heart was easily heard and not much increased in rate. As not a sound had been obtained after operation, it was determined to wait for the patient's natural disease, and then if possible to save the child. About two hours after admission the patient died, the fetal heart sounds were becoming

less audible and for the last fifteen minutes were so feeble that they could not be heard with a stethoscope. Section was performed at the moment of death as rapidly as possible. The child was toxic and feeble but rapidly began to breathe and cry. It was not quite at full term, weighing three pounds and fifteen ounces. The child lived for twenty-five days after its birth, dying of croupous pneumonia, with pleurisy. Microscopic section of the lungs showed many alveoli filled with fibrin and foci of round-cell infiltration and areas of necrosis. There was also pleurisy.

Pregnancy in a Case of Improved Sporadic Cretinism.—Welz (*Am. Jour. Obst.*, May,1919) reports the case of a patient, aged thirty-six years, concerning whom little early history could be obtained. The patient described a number of childhood's diseases which she had had and a few days ago contracted ivy poisoning. When twenty-three years old, and one year after marriage, the patient had a severe nervous breakdown and was in bed for three months, with great mental disturbance. When seen the patient's mental state was stunted, although fairly intelligent. The patient's weight had increased steadily since twelve years of age up to 189 pounds. The skin was dry, coarse in texture, yellowish-gray in color, the face puffy about the eyelids. The thyroid gland could not be palpated. The uterus indicated a pregnancy of thirty-six weeks, the pelvis was somewhat smaller than the average, but symmetrical and without great obstacle. The urine had been normal except for the low urea percentage. The case was evidently one of sporadic cretinism, complicated by generally contracted pelvis. Labor pains failed to secure the descent of the child and section was performed without accident. The mother was not able to nurse the child, but mother and child ultimately did well.

Abnormally Fat Breast Milk.—Slawik (*Deutsch. med. Wchnschr.* January 20, 1919) in the clinic at Prague has noted infants getting breast milk with too high fat percentage. Numerous tests in the clinic have shown that certain patients continuously produce milk much too fat or much below the normal proportion and the children suffer from this condition. When the milk is too fat vomiting occurs early and persists. This occurs immediately after feeding, although there is nothing to suggest spasm or overfeeding. These children lose their appetite for the breast milk, grow pale and drowsy, with flabby muscles. There may be obstinate constipation, or the stools may be thin and odorless, afterward becoming rancid and thicker.

Milk Secretion.—In the *Journal of the American Medical Association*, May 17, 1919 appears a review of this subject in which various theories are stated. Gowen of the Maine Experimental Station has found variations in the secretions of milk which cannot be reconciled with the cell disintegration hypothesis. The fat concentration of the milk was maintained throughout life, but the proportions of solids not fat, which include sugar, proteins and salts, declined somewhat. The butter fat increases in milk taken at evening, while the other solids did not share in this increase. This change in the ratio of fats and solids points to the cell destruction hypothesis. These inconsistencies point to a secretory hypothesis for milk production.

GYNECOLOGY

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Radium Treatment of Uterine Cancer.—Having conducted nearly two years of work with only small quantities of radium at his disposal, BAILEY (*Am. Jour. Obst.*, 1919, lxxx, 300) has reached the conclusion that the problems confronting the man possessing the small amount of radium salt are essentially different from those presented to the holders of several grams. With the small amount, in order to produce any effect at a distance from the applicator, it is necessary to leave the radium in position for such a length of time that there is a local necrosis. This is a serious affair because of the proximity of the bladder, rectum and ureters. In treating malignant conditions the possessor of 100 or 200 milligrams of the salt would do well at the present time, at least, to confine himself to the palliative treatment of inoperable and recurrent cancer and to the preoperative treatment of operable cancer. From January, 1915 to May, 1919, a period of four and one-third years, Bailey treated 356 cases of carcinoma. Of this number there were 20 cases that did not complete the treatment or were lost following the treatment. Three of these died following the first application while 14 were given but one application and failed to return. Three had the full treatment but did not return. This leaves 336 cases upon which the statistics of his report are based. Of this number there were 190 cases termed primary, that is, in which no operative procedure had been undertaken, except perhaps in a few cases a mild cauterization or curettage; 106 cases were recurrent cancer after a hysterectomy. Twenty-nine cases were treated after a Percy cauterization or an operation of the Percy type. As a result of experience with such types of cases as above outlined, Bailey has come to certain definite conclusions regarding the indications for radium application. The most advanced cases frequently present a massive growth involving all of the pelvic organs, but with little or no ulceration in the vagina. This is especially true of the recurrences. In such cases an application of radium can hardly do more than cause some slight diminution in size, with possibly local sloughing, and the patient's condition cannot be said to have improved; in fact, it eventually becomes worse than before and considerably more painful from the contraction of the tissues and the pressure upon nerve endings. Another type of the very advanced cancer is the ulcerating type, usually primary, with a deep cervical crater having undermined edges, so that the rectum and the bladder are in immediate proximity or involved in the growth. Treatment will relieve or partially

relieve, for a time the sloughing and discharge, but will almost invariably produce a fistula in the bladder or rectum earlier than it would otherwise occur. Advanced cases where the parametrium is deeply involved in one or both sides, providing that they are primary so that the cervix offers a location for the radium that is approximately in the middle of the tumor, are not infrequently greatly benefited, even to the extent in two instances of being free from the signs of the disease for considerable periods. The most that can be expected is the healing or partial healing of the local lesion with consequent disappearance of bleeding and discharge and some retrogression in the size of the parametrial involvement. Not infrequently the further extension of the growth is behind the vaginal vault. The palliation is often so great that the patient gains in weight, has a good color and enjoys a longer lease of life in comparative comfort than did those patients who, prior to the use of radium, had only the benefits of curettage or cauterization. Usually within a year a relapse occurs and the case slowly progresses toward the end. The last months are apt to be very painful, due to the general fibrosis throughout the pelvis, but there is little or no discharge. It is amazing how long patients will live in a condition of this kind, and even though they develop rectal fistulæ they remain clean by careful attention to the bowels. Experience shows that in this class, even though there is some question of the beginning involvement of the bladder wall, a complete and deep raying of the entire lower pelvis gives the woman the greatest prolongation of life. The *borderline case* by universal agreement most properly falls into the radium field. Here the lesion advances a short way into the parametrium on one or both sides, to an extent that is determined with difficulty, but the uterus is held somewhat by the indurated tissue; or the lesion of the cervix is not deep but overlaps to some extent upon the vaginal wall. In this class the most amazing results are accomplished by radium for it renders most of the cases operable and produces in nearly all the disappearance of cancer cells in the local lesion. There are in Bailey's series seven uteri that were removed following radiation in which the pathological picture upholds the latter statement, for in none was there found any cancer of the cervix. Of 17 cases that fell into this class in 1918 and were treated with radium alone, 5 died of cancer and 8 are in poor condition. There are 4 in this group that are in good condition and might have some prospects, although they cannot be said to be free of all clinical evidence of the trouble to date. In the operable cases, one of three procedures may be adopted: the uterus may be left *in situ* and massive radiation conducted through the parametrium, a simple hysterectomy may be done followed by radiation, or a radical operation may follow the complete or incomplete raying of the pelvis. The operable carcinoma of the body of the uterus is such an indeterminable thing from the standpoint of judging of its extent that treatment with radium alone is seldom justified. The flat cancer extending over most of the mucosa and involving the wall in certain areas can hardly be expected to resolve from the blind insertion of radium into the uterine cavity especially if the uterus is considerably enlarged. The prophylactic treatment following the removal of a tumor offers a field in which a great deal may be accomplished, provided the operator does not remove most of the

vagina, as this cavity gives the only practical entrance for the radium applicators. Early recurrent cancer following hysterectomy treated by massive doses and by cross-fire have resulted, in a number of cases, in complete retrogression and in numerous cases with a prolongation of the patient's life.

Value of Water in Nephrolithiasis.—In a very interesting article OCHSNER (*Jour. Am. Med. Assn.*, 1919, lxxiii, 1105) relates an unusual experience that he had in his early practise and points out the possibility of obtaining valuable suggestions from patients in certain cases. The patient in question was a manufacturer of steam boilers who had been a sufferer from recurrent renal colic. On asking him whether he had experienced any attacks recently, he stated that he was definitely through with renal colic, and suggested that if the doctors used their intelligence as actively in their profession as boiler manufacturers had to in their business, no one would ever have to experience a second attack unless he had more than one stone in his kidney to begin with. He stated that when his customers complained of their boilers filling up with lime in the form of scales, he advised them to use rainwater and this ended the trouble; so on the same principle he drank freely of distilled water, and had been free from a recurrence of kidney stone and renal colic. Ochsner immediately tried this treatment on a patient and in the twenty-nine years that followed, the patient never had another attack of colic, although he had been subject to them frequently before. He has made use of this method in an enormous number of cases, always with good results and the practice has been followed by many practitioners who have visited his clinic. While there is no doubt that the method must have been in use before the boilermaker discovered it, earlier reference to it seems to have escaped attention, except that the water from certain springs which is almost as free from lime as is distilled water has been used as a prophylactic against recurrence of renal stone from time immemorial.

Treatment of Bladder Tumors in Women.—KELLY (*Am. Jour. Obst.*, 1919, lxxx, 328) has been making an investigation to determine how best to approach and to deal with vesical papillomata and infiltrating cancers of the bladder wall not yet extensive. Before the days of cystoscopy a certain diagnosis of cancer or papilloma could not be made in the early stages and there was no such recourse as any real surgery of the bladder, beyond a mere incision and drainage for cystitis. Then came the era of free suprapubic openings of the bladder, followed by more or less extensive extirpations, with their too frequent recurrences, and now at last with our greater experience and greater familiarity with the diseases of the bladder and better methods of diagnosis he believes it is time to inaugurate also other yet better methods of treatment, and to hark back in some cases at least to more conservative procedures. According to Kelly, direct vision and direct accessibility through the air-distended bladder is the simplest, speediest and most effective way of reaching intravesical lesions, while fulguration is the most rapid way of destroying pedunculate and limited isolated lesions and is often permanently effective, although it utterly fails in many cases of dissemi-

nated lesions. It always fails in cases of infiltrating lesions and usually aggravates them, but radium is available and successful in all classes of cases and is especially of value in the group where fulguration fails. Radium should be applied directly under inspection to lesions in substantial dosage, say 250 mc. hours per month to an area 2 cm. square and experience has shown that it is better to apply radium in broken dosage, weekly, following and controlling results. It is best applied intravesically when it reaches the part in concentrated form without the risk of hurting the vagina incurred when the treatment is given through the vaginal wall. With the means now at our disposal of using these newer and most effective agencies in the treatment of vesical tumors by the direct open channels of the dilated urethra and air-dilated bladder, the treatment of vesical neoplasms enters upon a new phase of greater hopefulness and our effectiveness as urologists is greatly enhanced in dealing with these fairly common, distressing and formerly often fatal maladies. Kelly cautions that extreme watchfulness is necessary at three stages in all vesical neoplasms: (1) It is of the utmost importance to get the case under examination and treatment at the earliest possible moment. This can only be done by investigating at once and tracing to its source the slightest urinary hemorrhage. (2) When under treatment the case must be watched over a period of several months or longer until all trace of the disease has disappeared. (3) All these cases require watching at intervals of at first a few weeks and then of months for several years in order to catch any recurrence at an early stage.

OPHTHALMOLOGY

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Tonometric Values.—Priestley Smith (*British Jour. Ophthal.*, July, 1919, p. 293) concludes that the Schiötz tonometer measures the impressibility of the eye and can indicate changes of intra-ocular pressure in a given eye with great certainty. For example, it has proved (See McClean's experiments) that in animals and in man, and in glaucomatous as well as in healthy eyes, the intra-ocular pressure falls considerably during ether anesthesia. The tonometer cannot measure the intra-ocular pressure with precision because the relation of the impressibility of the eye to the intra-ocular pressure is different in different eyes; in other words, exact mercury equivalents for the degrees indicated by the pointer cannot be given. Approximate mercury equivalents are found by testing a number of human eyes with the tonometer and a manometer almost simultaneously. It is not possible, however, to carry out

the test under conditions quite like those under which the tonometer is ordinarily used. Equivalents found by experimenting on animal eyes are likely to be incorrect for human eyes. The value of any new tonometer will depend not merely on the excellence of its mechanism, but also and essentially on the tests by which it was regulated. Full details of the method and the results should be given. The Schiötz curves are not likely to be precisely correct, even for the average living eye for the reason just given. They are necessarily sometimes at fault for the individual eye. On the other hand it is not proved, and it is not likely, that the instrument errs to the extent that McClean's experiments suggest. (McClean's paper appeared in the *Arch. Ophthal.*, 1919, p. 23).

Syphilis and Irregularity of the Pupil.—DUJARDIN and RASKIN (*Annal d'Oculistique*, January, 1919, p. 89) from the study of a series of cases of irregularity of the pupil, conclude that such irregularity is a very frequent symptom in syphilitic infection. It is most common during the secondary stage; from thence onward it tends to become complicated with other disturbances of the pupil, although the irregularity may be the sole pupillary phenomenon in advanced syphilis. Reciprocally irregularity of the pupil in at least 70 per cent. of the cases is of syphilitic origin. Accordingly every case of irregularity of the pupil should be examined serologically and if this is negative by lumbar puncture.

Affections of the Lacrimal Passages.—LANDOLT (*Archiv. d'Oftal. Hispano-Amer.*, November, 1918, p. 544) maintains that probing does not cure. It simply prepares the way for medicaments. The canaliculi should not be disturbed whenever possible; if dacryocystitis necessitates incision, the upper should be selected. Where irrigation with solutions of sulphate of zinc, nitrate of silver, etc., do not suffice, both canaliculi should be slit and the two incisions united by scissors; this procedure will cure dacryocystitis even when complicated by fistula. The sac should never be opened from the anterior wall; it can be cauterized by introducing the mitigated stick of silver nitrate, neutralizing the excess with chloride of sodium. These applications may be repeated and occasionally replaced by the pure nitrate. Vacher injects into the suppurating sac a few drops of chromic acid, 1 to 50. The eye-ball must be well protected and also the palpebral conjunctiva with cotton saturated with a weak solution of oxygenated water in isotonic serum, first irrigating the sac and injecting a solution of cocain 1 to 10. To reëstablish the permeability of the canal, Vacher introduces and leaves in place, sometimes for several months, a fine silver wire, 1 to $1\frac{1}{2}$ mm. in diameter; curving the upper end is sufficient to hold it in place. This method of cauterization will almost always avoid the necessity of extirpating the sac, an operation which has been greatly abused.

Jaw-winking and Its Explanation.—Under the name of "jaw winking" is understood the curious and very striking appearance of retraction of the upper eyelid during movements of the jaw, face, pharynx and tongue. Since the first description by Marcus Gunn in 1883, there have appeared about 90 observations in the literature. LUTZ (*Arch. Ophthal.*, March, 1919, p. 144) rejects the explanations

hitherto advanced, but thinks that the phenomenon is produced by alterations of the supranuclear connection of the bulbar nuclei in the fasciculus long. post., and probably by a lesion of the inhibitive mechanism, just before the dentrites of the damaged nuclear cells. The palsy of the other eye muscles, which so often accompanies the jaw-winking phenomenon, is then caused by lesions of the nuclei themselves, or of the last unilateral part of the afferent or efferent fibers.

Correction of Keratoconus.—EPERON (*Annal. d'Oculist.*, April, 1919, p. 226) treats of correction of keratoconus by Müller's shells. Javal's ophthalmometer will measure the optical effect of these shells when their posterior surface is covered with varnish or gelatine; at the same time, Eperon has found, in trials upon human eyes that the refraction of these shells is generally inferior by several diopters to the reading of the ophthalmometer. This is due to the fact that the posterior surface of the shells is more curved than the anterior so that the shell acts like a divergent meniscus. Eperon uses an artificial eye with Müller's shells for cornea and thus measures directly by skiascopy with water as the posterior medium. In this way he has been able to show that, beside their insufficient refractive power, the shells have other defects, notably astigmatism, usually oblique, and also a conical deformation affecting at least one-quarter of the samples investigated. These shells are better tolerated than Sulzer's contact glasses, and much more satisfactory from the optical standpoint, although it is to be hoped that they may be improved as regards this point. It is possible to correct by them not only keratoconus and irregular astigmatism but also high myopia as well as aphakia.

Three Cases of Gas Infection of the Cornea.—PRINGLE (*British Jour. Ophthal.*, March, 1919, p. 110) reports 3 cases of gas infection of the cornea, following gunshot wounds of the eye. One of the most striking features in these 3 cases was the rapid involvement of the cornea. In each it was only a matter of a few hours, while in the last case the upper third of the cornea became infiltrated in forty-five minutes. It would appear as though it were necessary to have some break in the corneal epithelium and possibly in Bowman's membrane, before the gas organisms can gain access to the corneal substance. In the first 2 cases, this break was caused by actual wounds of the cornea, and in the last case by an ulcer following exposure of the cornea. In each case the eye was removed while the cornea alone was involved; it would have been extremely interesting to note the spread of the infection. The pathological report showed that only streptococci and staphylococci were isolated from the contents of the globe and that beyond inflammatory reaction, the sclera showed no signs of actual gas infection. It is probable that the sclera would offer considerably more resistance to the development of gas organisms than a damaged cornea. As streptococci and staphylococci were isolated from the iris and vitreous, infection had evidently spread through Descemet's membrane which had become disorganized, into the interior of the globe and whether or not the blood supply to the iris and ciliary body had anything to do with the barrier offered to the inroads of the gas organism in this direction, can only be conjectured.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF
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(1) The Oxygen of the Arterial and Venous Blood in Pneumonia and its Relation to Cyanosis. (2) The Oxygen and Carbon Dioxide Content of Arterial and of Venous Blood in Normal Individuals and in Patients with Anemia and Heart Disease. (3) Studies of Cyanosis. (I) Primary Causes of Cyanosis, (II) Secondary Causes of Cyanosis, (III) Erythrosis, or False Cyanosis.—The grouping of five recent studies of the blood gases in a variety of conditions, with especial reference to cyanosis, virtually constitutes a monograph on the subject. These papers, in that they are so closely related, may well be reviewed together. I.—STADIE (*Jour. Exper. Med.*, 1919, xxx, 215), impressed by the unusual frequency and intensity of the cyanosis of influenzal pneumonia, investigated the blood gas content in five normal individuals and in 33 patients with pneumonia. In the course of this work, he perfected a simple technic for arterial puncture. On normal subjects, the arterial unsaturation (the value indicating the difference between the actual and the possible oxygen content of a given specimen of blood) was found to be 5 per cent. of the total oxygen capacity. The venous unsaturation was 26.8 per cent. of the total oxygen capacity. In pneumonia, there was a great variation in findings. The arterial unsaturation ranged from 0.0 per cent. to 68.2 per cent., the venous from 14.4 per cent. to 85.5 per cent. It was generally found that an arterial unsaturation of over 20 per cent. was associated with the fatal outcome. The mean arterial unsaturation in fatal cases was 32 per cent. against 13.9 per cent. in the non-fatal ones. The venous unsaturations correspondingly averaged 57 per cent. and 36.3 per cent. Patients without cyanosis showed an arterial unsaturation very close to the normal, the mean figure being given as 5.4 per cent. A definite relation exists between arterial unsaturation and the appearance of cyanosis. The more marked the cyanosis, therefore, the greater is the degree of arterial unsaturation. Hence, the deduction is made that cyanosis in this type of pneumonia is due to incomplete oxygenation of venous blood in the lung. As the oxygen capacity was found to be even slightly higher than the normal (indicating a concentration of the blood) methemoglobinemia in the cases studied, was evidently a negligible factor. Stadie points out that none of the patients could be considered true lobar pneumonia so that this is not evidence against the possible occurrence of methemoglobin formation in that condition. Oxygen consumption, estimated as the difference between arterial and venous oxygen content, was not below normal limits; this indicates that the cardiac output is not diminished in influenzal pneumonia, thus corroborating the postmortem finding in regard to the heart. II.—HARROP (*Jour. Exper. Med.*, 1919, xxx, 241) studied a group of 15 normal individuals, in whom he estab-

lished the oxygen unsaturation of arterial blood at 4.5 per cent. a figure closely corresponding to that found by Stadie. No difference in arterial oxygen content was found at diverse points in the peripheral circulation. The blood, therefore, suffers practically no alteration in passage from the lung to the terminal arterioles and capillaries. This adds force to Stadie's point regarding cyanosis as an evidence of incomplete oxygenation of the blood leaving the lesser circulation. The normal individual after exercise showed lowered oxygen saturation, and at the same time, lowered carbon dioxide content of the arterial blood. In anemic patients, the arterial oxygen saturation was normal. The venous blood, however, showed low absolute value for oxygen content. But the oxygen consumption was maintained at normal. Cases of heart disease, without evidence of change in lungs, and at rest in bed, showed normal blood gas findings. The pernicious effect of lung involvement in connection with heart disease, resulting in interference with gaseous interchange, and the relation of this complication to cyanosis, is well brought out in a series of estimations on patients with cardiac decompensation and pulmonary changes. Patients with decompensation exhibited a marked degree of arterial unsaturation, which tended to return to normal as compensation was reëstablished, but only did so when the pulmonary lesions cleared up. A marked degree of arterial unsaturation was accompanied by an increase in oxygen consumption and as the degree of arterial unsaturation became less so was the oxygen consumption lowered toward the normal. These observations are entirely in accord with those of Stadie, pointing as they do to a pulmonary basis for the alteration in blood gas content. III.—Lundsgaard (*Jour. Med. Res.*, 1919, xxx, 259, 271 and 295) states, as the result of the analysis of venous blood in a considerable group of individuals with and without cyanosis, that neither increased carbon dioxide content of venous blood, nor low absolute oxygen content of venous blood has any relation to the clinical finding of cyanosis. He believes, rather, that increase of oxygen unsaturation of venous blood (*i. e.*, the presence of a difference greater than normal between the oxygen actually present in the venous blood and the total oxygen combining power of that blood) is the primary cause of cyanosis. As Lundsgaard has previously demonstrated, the normal resting individual never shows an oxygen unsaturation in the venous blood greater than 8 volumes per cent. This is interesting in view of the finding that among the patients with cyanosis, none showed a venous oxygen unsaturation below the figure just named. Apparently, then, at least this degree of unsaturation must be attained before cyanosis is possible as a clinical finding. But this does not mean that cyanosis invariably occurs at this point. A further study of the findings shows that only in event of a venous oxygen unsaturation of 13 volumes per cent. or greater was cyanosis always present. Why venous oxygen unsaturation up to 13 volumes per cent. may be found without cyanosis is explained by Lundsgaard on the basis of oxygen saturation of the arterial blood reaching the capillaries from the lungs. If this blood is completely saturated, a venous oxygen unsaturation of 13 may be reached before cyanosis appears. But if the arterial blood is not saturated with oxygen, cyanosis develops more readily, appearing with a venous oxygen unsaturation of 8 volumes per cent. The degree of arterial unsaturation in

cyanosis may thus be estimated from the degree of venous unsaturation present. Pulmonary disorders, as a rule, give rise to oxygen unsaturation, and are to be suspected even in absence of physical signs. The principal secondary cause of cyanosis, then, is a partial reduction (or incomplete oxygenation) of arterial blood going to the peripheral circulation, resulting from interference in gaseous interchange by some affection of lung and heart. Another secondary cause is decreased oxygen tension in the alveoli, as occurs in high altitudes. The second important secondary cause of cyanosis is increased reduction of the blood during its passage through the capillaries as in active physical exertion, and accompanying the retarded blood flow of decompensated heart lesions. Finally, Lundsgaard has studied the venous blood of a patient having the condition named erythrocythemia rubra vera by Osler. Here the normal oxygen unsaturation was found, though the hemoglobin and the total oxygen capacity were abnormally high. The carbon dioxide content was normal. By reason of the curious brick-red dusky color of the skin (false cyanosis), the term "erythrosis" is proposed as the name of the condition. This would seem to be no improvement on the former name, since it is less descriptive of the condition.

Contribution to Predisposing Factors in Pulmonary Tuberculosis.—Various views are held upon the direct and indirect influence of artificial pneumothorax upon the progress of tuberculosis in the human. Some have claimed that the collapsed lung is subject to a condition of venous stasis which is antagonistic to the progress of a tuberculous infection. SHAW (*Am. Rev. Tuber.*, 1919, iii, 410) in a limited number of animal experiments comes to conclusions at variance with the above conception. The production of artificial pneumothorax followed either by intravenous inoculation or intratracheal inoculation of tubercle bacilli was followed by the development of tuberculous lesions within the collapsed lung, while the lung of the opposite side remained free. He suggests that these findings should receive consideration in the analysis of spontaneous human infection.

Primary Spontaneous Tumors of the Testicle and Seminal Vesicle in Mice and Other Animals.—Tumors of the testicle in lower animals seem to be very rare as very few instances can be found in the literature. Those reported have occurred for the most part in horses and dogs. There is not a single instance of such a tumor occurring in mice. The authors, SLYE, HOLMES and WELLS (*Jour. Cancer Res.*, 1919, iv, 207) can add from their series of 19,000 autopsies on mice dying natural deaths, 28 instances of primary tumor of the testicle. Most of these resemble the human tumor in every respect being composed of epithelial cells closely resembling those of the seminiferous tubules and arranged in an alveolar structure. The tumors are usually very vascular with large blood channels, the walls of which are often composed solely of tumor cells. Cells with atypical and giant nuclei are common and multinucleated cells are often found. For the most part these new growths of the testis are essentially benign in character, developing very slowly, rarely ulcerating, generally distinctly limited by the tunica albuginea and in no case with distinct remote metastases. One case presented a series of six contiguous independent nodules and one case showed

bilateral testicular tumors. Two of the growths resembled typical spindle-cell sarcoma, one arising at the site of a wound. Three of the so-called orchidoblastomas followed trauma. There was no evidence that any of these neoplasms had arisen in a teratomatous growth and no true teratomas were observed, this in direct contrast to the frequency of teratomas in the human testicle. With the exception of one tumor all the 28 neoplasms of the testis in mice occurred in members of a single strain of mice and its hybrid derivatives, thus bearing out the theory that heredity influences the incidence of tumor development in different organs or tissues. This fact may account for the absence in the literature of recorded cases of tumor of the testis in mice from other laboratories. As for tumors of the seminal vesicles the authors found one case of polymorphous-cell sarcoma, apparently only the second case on record of such a growth in the seminal vesicle of a lower animal.

Cancer in Hainan, China.—It is generally agreed that cancer is a disease occurring after middle life and due to a variety of causes but despite an almost innumerable list of possible contributing factors the subject still remains an unsolved problem. BERCOVITZ (*Jour. Cancer Res.*, 1919, iv, 229) has found in studying the disease among the Chinese a number of phases differing from those usually encountered. It must be noted that medical conditions in China are very different from those of the western world and may account in a large measure for the differences which the author found. Many cases do not come to the hospital until inoperable and only after all native remedies have failed. Until very recently prejudice has kept women away from medical and surgical aid. A striking point of difference which the author offers without being able to give any explanation for it is that cancer in China is as much a disease of the early decades of life as of the later. Of 131 cases of cancer 50.3 per cent. occurred before the age of forty. The most frequent locations of malignant growths are the penis, skin and cervical glands. The only reasons to be assigned for these sites are the high incidence of syphilis among the Chinese male population and attempts to cure the primary lesion by the application of highly caustic native remedies. Counter-irritation is extensively practiced by the Chinese to drive out evil spirits supposed to be the cause of disease. Moreover the Chinese are as a rule very scantily clad. The arms, trunk and legs of the men who work in the fields being bare, the rays of the sun may be a contributing factor. The author is unable to explain the great frequency of cancer of the cervical glands unless perhaps through infection from the throat since in most cases there are no marks on the neck to indicate previous counter-irritation. The author notes the infrequency of cancer of the stomach and of the uterus. For the former he offers the explanation that certain virulent streptococic infections which according to Rosenow are responsible for gastric ulcer are not found among the people of Hainan. Infections due to streptococci, as scarlet fever, appendicitis and acute articular rheumatism (non-gonorrheic) are practically unknown in that part of China. The only reason to be given for the infrequency of cancer of the uterus is the one noted above that until very recently women have not sought medical aid. It is rather suggestive, too, that the virulent infections of the female generative organs seem to be infrequent among the Chinese.

HYGIENE AND PUBLIC HEALTH

UNDER THE CHARGE OF
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Influenza in Three Chicago Groups.—JORDAN (*Public Health Reports*, 1919, xxxiv, 1528) summarizes the result of his studies as follows: With respect to age the figures show a higher attack rate among the pupils of the university elementary school (ages four to thirteen) than among those of the high school (ages fourteen to eighteen); the teachers in these schools had a lower attack rate than the pupils. Apparently a definite selective age incidence is manifested since the pupils in these schools are from the same section of the city and to a large extent from the same families, and were presumably exposed in similar degree. With respect to sex there was no noteworthy difference among the pupils in the high and elementary schools (attack rates, 230 for boys, 231 for girls). It is fair to assume that the chances for acquiring infection were substantially the same for these children and that one sex was as much exposed to infection as the other. Among the employees of the Chicago Telephone Company, on the other hand, the men were affected in considerably lower proportion than the women (151 per 1000 for men and 233 for women). Probably the age factor was largely responsible for this difference, since the women employees are of a much lower average age than the men. Illness reported under the heading of "Colds," etc., seems to have been at a considerably higher level during the autumn of 1918 than during the corresponding period of 1917. This was particularly the case among the pupils of the university schools and to a somewhat lesser degree among the employees of the Chicago Telephone Company. Comparison of the reported cases of influenza and colds in the latter group for the months of September and November suggests that some cases of influenza were reported under the former heading. The differing degrees of incidence in the various groups here considered are specially striking. The attack rate among the employees at the various Chicago telephone exchanges ranged from 30 to 270 per 1000, although the working conditions in the several exchanges were not materially different. The highest attack rate recorded for any group occurred among members of one section of the Student Army Training Corps at the University of Chicago (398 per 1000), while the lowest (39 per 1000) was among the members of the other section of the same corps. The former group was particularly exposed to infection, while the latter, although composed of men of similar ages, living under substantially similar conditions with those of the first group, were guarded to a considerable extent against contact with beginning cases. The

data obtained in regard to the schools apparently indicate that the schools were not important distributing centers for the infection. No explosive outbreak occurred in any one grade, and the four days of the Thanksgiving holiday evidently afforded more favorable opportunities for infection than did the days of regular school attendance. The low pneumonia incidence and the absence of deaths among the pupils of these schools (188 cases) is noteworthy. The influence of careful supervision of a somewhat segregated group of individuals is shown by the low attack rate in section A of the Student Army Training Corps.

The Occurrence of Malaria Parasites in Anopheles Crucians in Nature.—MAYNE (*Public Health Reports*, 1919, xxxiv, 1355) reports that Anopheles crucians, which a few years ago was established as an efficient host for the malaria parasites under experimental conditions, has been found infected in nature, a single specimen having come under his observation among 20 examined, while 17 infected A. quadrimaculatus were found among 709 examined.

Anopheles Crucians Wied. as an Agent in Malaria Transmission.—METZ (*Public Health Reports*, 1919, xxxiv, 1357) made observations on the habits of Anopheles crucians, with reference to the probability of this species transmitting malaria, and found that it is not often present in dwellings unless the species is very prevalent but it is very common in privies. He found about as high a percentage of infection among Anopheles crucians as among Anopheles quadrimaculatus. Metz's conclusions are as follows: It is believed that the data given above leave no doubt as to the susceptibility of Anopheles crucians to infection with malaria plasmodia under natural conditions. Likewise, they indicate that, although the habits of this species are probably less conducive to natural infection than are those of quadrimaculatus, nevertheless a considerable amount of infection occurs. This evidence of crucians' susceptibility of infection in nature, taken in conjunction with the demonstration of its infectivity; *i. e.*, its role as a vector, under laboratory conditions (Mitzmain, 1916 (a), King, 1916), would indicate that this species is potentially of definite sanitary importance. The evidence is too meager, however, to indicate the degree of importance it merits as compared with quadrimaculatus and punctipennis. Considering its habits, it seems probable that crucians is primarily an out-of-door biter, *i. e.*, it is probably most effective on porches and in outhouses. If such proves to be the case, especial precautions against out-of-door exposure in the evening will be necessary in crucians infested districts, whereas screening of dwellings will be relatively unimportant except where other species must also be considered.

The Epidemiology of Influenza.—FROST (*Public Health Reports*, 1919, xxxiv, 1823) reviews the course of the epidemic in the United States in a manner that does not permit of satisfactory abstracting, but the views of the author on several points are of such great interest as to justify special mention: The data indicated that one attack confers immunity against a second one, at least for a period of several months. The general characteristics of the epidemic are similar to those of the 1889–1890 epidemic, but there was a higher frequency of pneumonia and a

higher mortality, especially among young adults. The disease is believed to be spread "directly by contact, in the broad sense." As to the probability of recurrence, the author points out that previous experience leads us to expect this, but as the epidemic of this past year has been unusually severe and has shown several distinct phases, we have some ground for hoping that it has probably run its course.

The Malaria Problem of the South.—CARTER (*Public Health Reports*, 1919, xxxiv, 1927) stresses the fact that mortality statistics give no adequate indication of the great economic losses chargeable to malaria. He states that each death from pneumonia corresponds to about 125 days' illness; one from typhoid fever 450 to 500 days, while one from malaria corresponds to 2000 to 4000 sick days. The amount of malaria may be as high as 90 per cent. of the population and 40 per cent. to 60 per cent. is not unusual, and this fact is rapidly and certainly reflected in economic conditions. The area of severe prevalence is lessening, due largely to improved economic conditions and to reduction in the price of quinin. The following methods of control are described and their applicability indicated: (1) Get rid of Anopheles mosquitoes—no other kinds make any difference in malaria; (2) prevent the access of Anopheles mosquitoes to man; (3) free all persons in the community from malaria parasites; (4) protect persons against infection by means of quinin.

Occupation and Mortality.—WYNNE and GUILFOY (*Public Health Reports*, xxxii, 885) show that in New York, in 1914, the relative mortality from pulmonary tuberculosis was lower among blacksmiths, considered as a group, and also in each age group, than the average relative mortality from the same cause, of all occupied persons over fifteen years of age. Clerks, bookkeepers, office assistants, etc., had a mortality from the disease almost twice that of all occupied persons over fifteen years of age, while cigar-makers and tobacco-workers had a mortality 25 per cent. above the average. Garment workers' mortality from pulmonary tuberculosis compared favorably with that of all occupied persons, while that of laborers ranked next to bookkeepers and clerks' mortality from the disease. The tuberculosis mortality for machinists was higher than the average, as was that for painters, paper-hangers, varnishers, etc. Among railway track and yard-workers and saloon-keepers the mortality from the disease was not greatly in excess of the average. The mortality from tuberculosis among teamsters and drivers was so much above the average as to attract special attention; it is believed to be largely due to the high incidence of alcoholism. Cancer mortality was high among those engaged in sedentary occupations and low in the occupations requiring active physical labor. Mortality from cancer was low where that from tuberculosis was high. It was lowest among teamsters and drivers, among whom tuberculosis was highest. The highest percentage of deaths from alcoholism occurred among saloon-keepers and bartenders, with that of laborers next. Organic heart disease mortality was low for blacksmiths, printers, varnishers, painters, paper-hangers, teamsters, railway track and yard employees and laborers, and very low among clerks, bookkeepers, office assistants, etc., and saloon-keepers. It was high among cigar-

workers and garment-workers. The mortality from nephritis was above the average among blacksmiths, garment-workers and cigar-workers. It was low or close to the average among those engaged in the other occupations. The mortality from lobar pneumonia was above the average among blacksmiths, clerks and bookkeepers, teamsters, laborers, track and yard workers, saloon-keepers and compositors and printers, especially among the latter. Mortality from the disease among painters and paper-hangers, machinists and garment-workers was not excessive. The pneumonia mortality for tobacco workers was very low. The highest mortality from cirrhosis of the liver was among saloon-keepers. Occupation appeared to have no bearing in other cases. Mortality from suicide was highest among cigar-makers, garment-workers and saloon-keepers. The majority of deaths from lead-poisoning occurred among painters. Mortality from accident was higher than the average among blacksmiths, laborers, machinists, painters, paper-hangers, teamsters and railway track and yard workers, the highest being among the latter. Poorly ventilated shops accounts for the high mortality from respiratory diseases among clerks, bookkeepers, etc., and printers and compositors. The low mortality from pulmonary tuberculosis among garment-workers is explained by the racial immunity and the manufacture of clothing in the homes. Inasmuch as mortality from cancer is uniformly lower in strenuous occupations, there appears to be some relation between the disease and occupation. The unduly high mortality from heart and Bright's disease among tobacco-workers and garment-workers cannot be entirely explained by the advanced age of the occupants. Alcohol appears to be an important hazard among saloon-keepers. The pneumonia hazard seems to be greatest among those grouped together in offices and shops and among those alternately exposed to high and low temperatures.

The Dust Hazard in the Abrasive Industry.—WINSLOW, GREENBERG and GREENBURG (*Public Health Reports*, 1919, xxxiv, 1171) state that exposure to mineral and metallic dusts is accompanied by excessive tuberculosis ratios. The small, sharp, hard, non-absorptive particles are the most dangerous ones. The inhalation of these leads to an initial fibrosis which leads in many cases to the development of pulmonary tuberculosis. The manufacture of abrasive materials is, by its very nature, exceptionally hazardous. Examinations of the dust at various parts of abrasive factories showed varying and often large numbers of particles, and this is true even of offices and out of doors near the factory. Suggestions are made looking to the reduction of the dust hazard in the abrasive industry.

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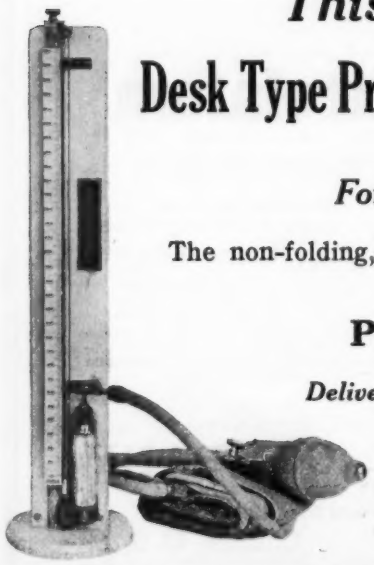

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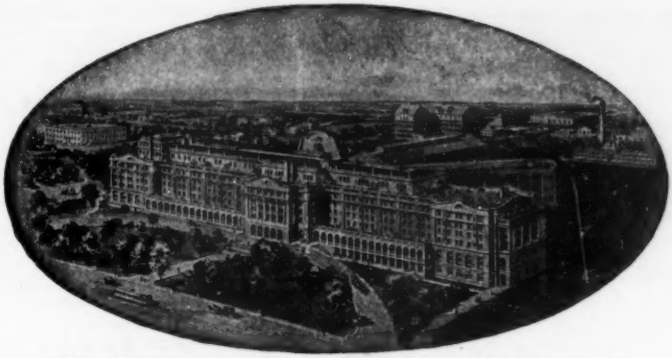

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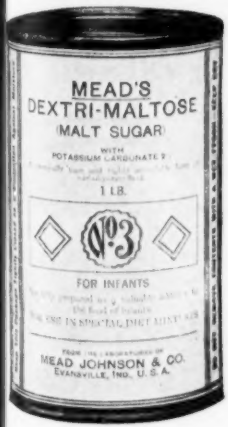

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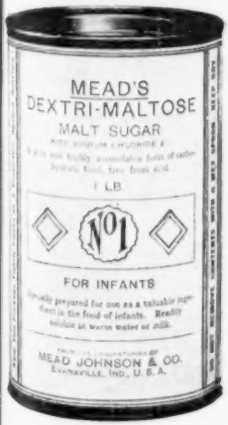

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